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ENERGY

A SPECIAL BIBLIOGRAPHY WITH INDEXES

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16. Abstract This literature survey of special energy and energy related documents lists 1708 reports, articles, and other documents introduced into the NASA scientific and technical information system between January 1, 1968, and December 31, 1973. Citations from International Aerospace Abstracts (IAA) and Scientific and Technical Aerospace Reports (STAR) are grouped according to the following subject categories: energy systems; solar energy; primary energy sources; secondary energy sources; energy conversion; energy transport, transmission, and distribution; and energy storage. The index section includes the subject, personal author, corporate source, contract, report, and accession indexes.		
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ENERGY

A Special Bibliography With Indexes

A selection of annotated references to documents that were announced from January 1, 1968 through December 31, 1973 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*



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INTRODUCTION

This special literature survey of energy and energy-related documents lists 1708 reports, articles, and other documents that were announced from January 1, 1968 through December 31, 1973 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*.

In its subject coverage *Energy* contains references on regional, national, and international energy systems; research and development on fuels and other sources of energy; energy conversion, transport, transmission, distribution, and storage, with special emphasis on use of magnetohydrodynamics, hydrogen, and solar energy. References on remote sensing of energy resources are also included.

The abstracts have been arranged in special subject categories chosen for this publication; the scope of each is described on page viii.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *STAR* or *IAA*, including the original accession numbers from the respective announcement journals. This procedure, which saves time and money, accounts for the variations in type and citation appearances.

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A quarterly continuing bibliography on this subject is planned.

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TABLE OF CONTENTS

Subject Categories

Abstracts in this Bibliography are grouped under the following categories:

page:

01 ENERGY SYSTEMS

Includes energy policies and strategies; regional, national and international energy requirements and legislation; energy conservation options, hydrogen-energy systems, and impact of energy systems on environment.

1

02 SOLAR ENERGY

Includes solar collectors and solar cells; efforts to achieve practical and economical use of solar energy for heating and cooling of buildings, heating of water, generation of electricity, and production of clean fuel.

23

03 OTHER PRIMARY ENERGY SOURCES

Includes petroleum and oil, coal, shale, natural gas; nuclear fuel; wind power, geothermal energy, remote sensing of energy resources.

71

04 SECONDARY ENERGY SOURCES (Derived from Primary Sources)

Includes hydrogen, methanol, ammonia, synthetic fuels, coal gasification and conversion; bioconversion of organic materials.

115

05 ENERGY CONVERSION

Includes photovoltaic power conversion; superconductive or cryogenic systems for electric production; electromagnetic wave energy conversion; plasmas and magnetohydrodynamics; fuel cells; thermionic or thermoelectric conversion; liquid metal conversion; and thermomechanical energy conversion using Brayton cycle (gas turbines or gas turbine engines) Rankine or Stirling cycles, topping or bottoming cycles.

119

06 ENERGY TRANSPORT, TRANSMISSION, DISTRIBUTION

Includes technological or economic viewpoints in the transport of fuels; transport by pipes, tubes, etc; microwave transmission; laser transmission.

257

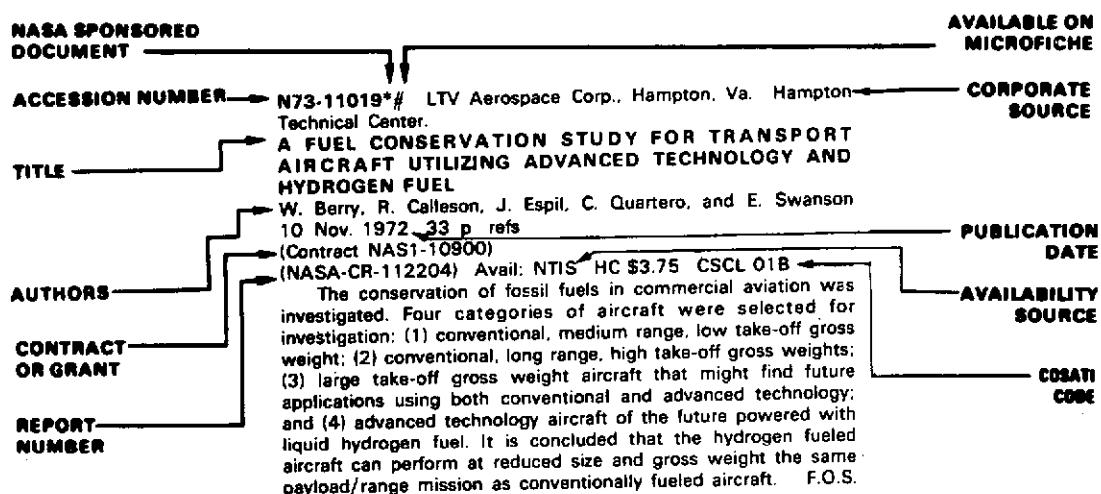
07 ENERGY STORAGE

Includes flywheels, springs; heat stored in rocks, metals and other materials, nickel-cadmium batteries, lithium-sulfur batteries, solid electrolytes.

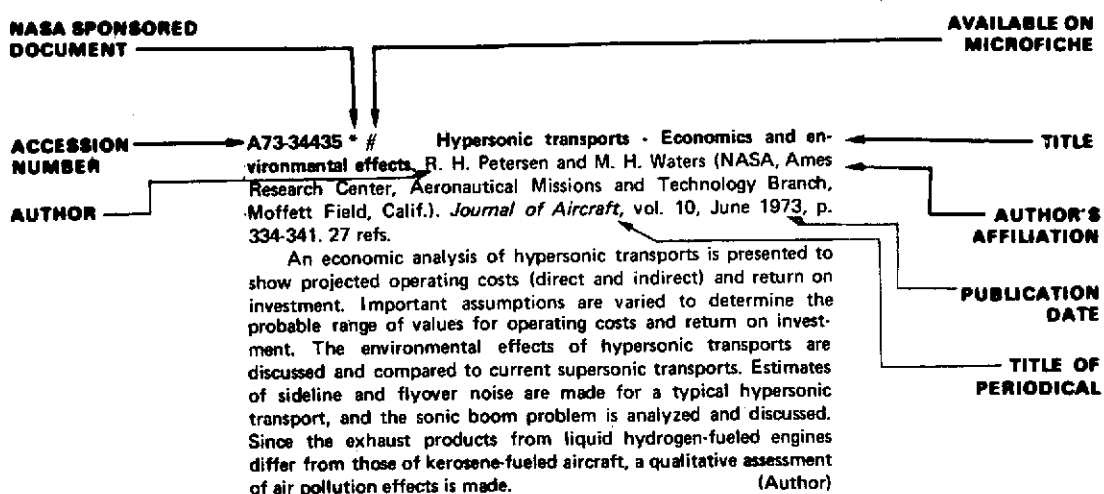
261

SUBJECT INDEX	A-1
PERSONAL AUTHOR INDEX	B-1
CORPORATE SOURCE INDEX	C-1
CONTRACT NUMBER INDEX	D-1
REPORT/ACCESSION NUMBER INDEX	E-1
ACCESSION NUMBER INDEX	F-1

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A Special Bibliography

ENERGY

APRIL 1974

01 ENERGY SYSTEMS

Includes energy policies and strategies; regional, national and international energy requirements and legislation; energy conservation options; hydrogen-energy systems; and impact of energy systems on environment.

A68-33457 *

FUTURE COST OF LIQUID HYDROGEN FOR USE AS AN AIRCRAFT FUEL.

Darrell E. Wilcox, Cynthia L. Smith (NASA, Office of Advanced Research and Technology, Mission Analysis Div., Moffett Field, Calif.), Halden C. Totten, and N. C. Hallet (Air Products and Chemicals, Inc., Allentown, Pa.).

IN: AVIATION AND SPACE: PROGRESS AND PROSPECTS; PROCEEDINGS OF THE ANNUAL AVIATION AND SPACE CONFERENCE, BEVERLY HILLS, CALIF., JUNE 16-19, 1968.

New York, American Society of Mechanical Engineers, 1968, p. 471-478. 8 refs.

The cost of LH_2 is a critical factor in the future economic feasibility of hydrogen-fueled aircraft. A study has been made of LH_2 production cost based upon projection of the increased demand associated with hydrogen-fueled aircraft. Production costs were estimated at ten important international locations. Variables investigated were plant capacity, production methods, probable technological advances, and the effects of the geographical location of raw materials and energy sources. The results of the study indicate that the future production cost of LH_2 may range from 8 to 13 cents per pound, depending on the location and quantity required. (Author)

A69-23433

ELECTRICITY FROM MHD: INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968. 720 p. In English, French, Russian, and Spanish. \$12.

CONTENTS:

FOREWORD. 2 p.

DIAGNOSTICS.

THE INFLUENCE OF BOUNDARY LAYERS ON SPECTROSCOPIC TEMPERATURE MEASUREMENTS IN MHD CHANNELS. G. F. Hohnstreiter, C. H. Kruger, R. M. Evans, and M. Mitchner (Stanford University, Stanford, Calif.), p. 3-11.

MEASUREMENT OF THE VELOCITY OF CONDUCTING MEDIA.

G. W. Schnell (Stuttgart, Technische Universität, Stuttgart, West Germany), p. 13-25.

THE DIRECT MEASUREMENT OF ELECTRON DENSITY IN AN MHD DUCT. J. D. E. Beynon, A. George (Southampton, University, Southampton, England), J. Chamberlain, and H. A. Gebbie (Ministry of Technology, National Physical Laboratory, Teddington, Middx., England), p. 27-31.

STEADY-STATE NON-EQUILIBRIUM IONIZATION.

REACTION RATES AND ENERGY DISTRIBUTIONS DURING IONIZATION AND RECOMBINATION PROCESSES IN OPTICALLY-THIN PLASMAS. M. Zgorzelski (Massachusetts Institute of Technology, Cambridge, Mass.), p. 35-52. 9 refs.

NECESSARY CONDITIONS FOR THE VALIDITY OF THE TWO-TEMPERATURE PLASMA MODEL. J. F. Shaw, M. Mitchner, and C. H. Kruger (Stanford University, Stanford, Calif.), p. 53-64. 15 refs.

ELECTRON COOLING IN THE PRESENCE OF NITROGEN AND HYDROGEN [REFROIDISSEMENT DES ELECTRONS EN PRESENCE D'AZOTE ET D'HYDROGENE]. J. Bernard and E. Labois (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 65-75.

ELECTRICAL CONDUCTIVITY AND ENERGY BALANCE IN A NONEQUILIBRIUM PLASMA - NEON-CESIUM, KRYPTON-CESIUM, XENON-CESIUM GAS MIXTURES [ELEKTROPROVODNOST' I BALANS ENERGII V NERAVNOVESNOI PLAZME - SMESI NEON-TSEZII, KRIPTON-TSEZII, KSENON-TSEZII]. Ju. M. Volkov and D. D. Maliuta (Akademiia Nauk SSSR, Moscow, USSR), p. 77-96. 16 refs.

CONTRIBUTION TO THE THEORY OF NONEQUILIBRIUM IONIZATION IN A LOW-TEMPERATURE PLASMA [K TEORII NERAVNOVESNOI IONIZATSII V NIZKOTEMPERATURNOI PLAZME]. L. M. Biberman, V. S. Vorob'ev, and I. T. Iakubov (Akademiia Nauk SSSR, Moscow, USSR), p. 97-116. 10 refs.

ELECTROPHYSICAL AND RADIATIVE PROPERTIES OF A NONEQUILIBRIUM ARGON-POTASSIUM PLASMA AS A POSSIBLE WORKING FLUID FOR AN MHD GENERATOR [ELEKTROFIZICHESKIE I RADIATSIONNYE SVOISTVA NERAVNOVESNOI ARGON-KALIEVOI PLAZMY-VOZMOZHNOGO RABOCHEGO TELA MGD-GENERATORA]. V. G. Andropov, E. I. Asinovskii, V. M. Batenin, G. S. Lopatskii, and V. F. Chinnov (Akademiia Nauk SSSR, Moscow, USSR), p. 117-144. 25 refs.

EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF SMALL NITROGEN IMPURITIES ON THE ELECTRON ENERGY BALANCE IN AN INERT GAS [EKSPERIMENTAL'NOE ISSLEDOVANIIE VLIYANIYA MALYKH PRIMESEI AZOTA NA BALANS ENERGII ELEKTRONOV V INERTNOM GAZE]. I. A. Vasil'eva and Ju. Z. Zhdanova (Akademiia Nauk SSSR, Moscow, USSR), p. 145-163. 18 refs.

DISCHARGE CHARACTERISTIC AND RELAXATION PROCESSES IN A Cs-He THERMAL PLASMA. A. Boschi, N. Merzagora, and A. Tamburrano (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy), p. 165-187. 16 refs.

TRANSIENT NON-EQUILIBRIUM IONIZATION.

EXCITATION AND IONIZATION PROCESSES IN NON-EQUILIBRIUM MHD PLASMAS. T. Takeshita and L. M. Grossman (California, University, Berkeley, Calif.), p. 191-206. 13 refs.

01 ENERGY SYSTEMS

- RECOMBINATION TRANSIENTS IN ARGON-CESIUM DISCHARGES [TRANSITOIRE DE RECOMBINAISON DANS LES DECHARGES ARGON-CESIUM]. J. Bernard, E. Labois, and P. Ricateau (Commissariat à l'Energie Atomique, Cif-sur-Yvette, Essonne, France), p. 207-217. 8 refs.
- MEASUREMENTS OF SEVERAL TRANSPORT COEFFICIENTS OF MHD WORKING GASES. T. Bohn (Kernforschungsanlage Jülich GmbH, Jülich, West Germany), p. 219-237. 25 refs.
- RATE OF PROPAGATION OF THE IONIZATION FRONT IN A MAGNETIC FIELD [SKOROST' RASPROSTRANENIYA FRONTA IONIZATSII V MAGNITNOM POLE]. V. T. Karpukhin and A. V. Nedospasov (Akademiia Nauk SSSR, Moscow, USSR), p. 239-248. 8 refs.
- INVESTIGATION OF THE DEVELOPMENT OF IONIZATION AT THE INLET OF AN MHD-GENERATOR CHANNEL [ISSLEDOVANIIE RAZVITIYA IONIZATSII NA VKHODE V KANAL MGD-GENERATORA]. N. A. Krushilin and I. T. Iakubov (Akademiia Nauk SSSR, Moscow, USSR), p. 249-265.
- PLASMA-PARAMETER RELAXATION SIMULATING THE INLET OF AN MHD-GENERATOR CHANNEL [RELAKSATSIIA PARAMETROV PLAZMY, MODELIRUIUSHCHEI VKHOD V KANAL MGD-GENERATORA]. D. N. Novichkov and V. V. Glebov (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, USSR), p. 267-286.
- PHENOMENA DURING PLASMA DECAY AT HIGH PRESSURE IN HELIUM AND ARGON WITH CESIUM VAPOR ADMIXTURES AND IN PURE CESIUM VAPOR [AVLENIYA PRI RASPADE PLAZMY V GELII I ARGONE PRI POVYSHENNOM DAVLENIII S PRIMES'IU PAROV TSEZIA I V CHISTYKH PARAKH TSEZIA]. N. D. Morgulis, I. N. Polushkin, and V. I. Lukashenko (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR), p. 287-302. 15 refs.
- PRE-IONIZATION AND GAS DISCHARGE.
- DISCHARGE CHARACTERISTICS IN A SEEDED PLASMA FLOW. O. Biblarz and R. H. Eustia (Stanford University, Stanford, Calif.), p. 307-321. 16 refs.
- MECHANISM FOR A LOW-CURRENT CATHODE DISCHARGE ACROSS A PLASMA FLOW. B. F. Forster (Stuttgart, Technische Universität, Stuttgart, West Germany), p. 323-330.
- INVESTIGATION OF ARGON DISCHARGES WITH METAL CAPILLARY CATHODES. G. Hahn and M. Salvat (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 331-342. 7 refs.
- DEPENDENCE OF ELECTRICAL CONDUCTIVITY IN A RARE-GAS/ALKALI PLASMA ON THE GAS TEMPERATURE AND ON PRE-IONIZATION. G. Brederlow, M. Salvat, and R. Schwenn (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 343-353. 15 refs.
- FIELDS AND FLOW IN MHD CHANNELS.
- NONLINEAR INSTABILITY IN MHD BOUNDARY LAYERS [INESTABILIDAD NO LINEAL EN CAPAS LIMITES MHD]. F. Cocho Gil (Comisión Nacional de Energía Nuclear, Mexico City, Mexico) and N. Grijalva Ortiz (México, Universidad Nacional Autónoma, Mexico City, Mexico), p. 357-373. 7 refs.
- THE VARIATIONAL PROBLEM FOR MHD GENERATORS. Y. Ozawa and N. Kayukawa (Hokkaido University, Sapporo, Japan), p. 375-383.
- ELECTRICAL EQUIVALENT CIRCUITS OF D.C. MAGNETO-PLASMA DYNAMIC CONVERTERS. O. H. Gruber (Stuttgart, Technische Universität, Stuttgart, West Germany), p. 385-395.
- SIMULATION OF AN MHD GENERATOR USING SEMICONDUCTING PLATES TO INVESTIGATE THE CURRENT DISTRIBUTION FOR VARIOUS ELECTRODE SHAPES. F. Braouezec and M. Salvat (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 397-408.
- MEASUREMENTS OF POTENTIAL DISTRIBUTION, ELEVATION OF ELECTRON TEMPERATURE AND VOLTAGE/CURRENT CHARACTERISTICS OF AN ALKALI-SEEDED RARE-GAS FARADAY-TYPE MHD GENERATOR. G. Brederlow and H. Zinko (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 409-417.
- REDUCTION OF THE OPEN-CIRCUIT VOLTAGE BY BOUNDARY LAYER LEAKAGE CURRENTS IN EXPERIMENTAL FARADAY-TYPE MHD GENERATORS. G. Brederlow, L. L. Lenzel, and H. Zinko (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 419-430.
- EXPERIMENTAL DETERMINATION OF THE CURRENT DENSITY DISTRIBUTION IN A SIMULATED MHD GENERATOR WITH ALLOWANCE FOR RELAXATION EFFECTS. G. Brederlow and G. Dodel (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 431-441. 9 refs.
- ELECTRIC FIELDS IN MHD-GENERATOR CHANNELS IN THE PRESENCE OF A POTENTIAL DROP AT THE ELECTRODES [ELEKTRICHESKIE POLIA V KANALAKH MGD-GENERATOROV PRI NALICHII PRIELEKTRODNOGO PADENIYA POTENTSIALA]. A. B. Vatazhin (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), p. 443-461.
- METHODS OF DETERMINING INDUCED MAGNETIC FIELDS IN LINEAR DC MHD GENERATORS [METODY OPREDELENIYA INDUTSIROVANNYKH MAGNITNYKH POLEI V LINEIYNYKH MGD-GENERATORAKH POSTOYANNOGO TOKA]. A. I. Bertinov, D. A. But, and V. I. Chitechian (Moskovskii Aviatsonnyi Institut, Moscow, USSR), p. 463-485. 10 refs.
- SOME RESULTS OF A FURTHER THEORETICAL STUDY OF MHD FLOWS [NEKOTORYE REZULTATY DAL'NEISHEGO TEORETICHESKOGO ISSLEDOVANIYA MGD-TECHENII]. L. A. Vulis and K. E. Dzhaugashin (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR), p. 487-496.
- INSTABILITIES.
- QUASI-LINEAR PLANE WAVE STUDY OF ELECTROTHERMAL INSTABILITIES. A. Solbes (Massachusetts Institute of Technology, Cambridge, Mass.), p. 499-518. 15 refs.
- EXPERIMENTAL INVESTIGATION OF INSTABILITIES IN A POTASSIUM-SEEDED ARGON PLASMA IN CROSSED ELECTRIC AND MAGNETIC FIELDS. W. Riedmüller (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 519-528. 6 refs.
- INVESTIGATION OF IONIZATION INSTABILITY IN A DISK HALL CHANNEL [ISSLEDOVANIIE IONIZATSIONNOI NEUSTOICHIVOSTI V DISKOVOM KHOLLOVSKOM KANALE]. A. F. Vitshas, V. S. Golubev, and M. M. Malikov (Akademiia Nauk SSSR, Moscow, USSR), p. 529-545.
- CESIUM-DOPED MERCURY AS A WORKING FLUID FOR STUDYING THE SPECIFIC FEATURES OF MHD GENERATORS BASED ON A RANKINE CYCLE [RTUT' S TSEZDEM KAK RABOCHEE VESHCHESTVO DLIA IZUCHENIYA OSOBENNOSTEI MGD-GENERATOROV, RABOTAUSHCHIKH NA TSKLE RENKINA]. Ju. A. Karnev, V. T. Karpukhin, and A. V. Nedospasov (Akademiia Nauk SSSR, Moscow, USSR), p. 547-568. 8 refs.
- CERTAIN CHARACTERISTICS OF AN UNSTABLE QUASI-EQUILIBRIUM PLASMA IN CROSSED EH FIELDS [NEKOTORYE KHARAKTERISTIKI NEUSTOICHIVOI KVAZIRAVNOVESNOI PLAZMY V SKRESHCHENNYKH EN POLIAKH]. I. Ia. Shipuk and S. V. Pashkin (Akademiia Nauk SSSR, Moscow, USSR), p. 569-580.
- INFLUENCE OF PLASMA NON-HOMOGENEITIES ON THE MAGNETO-ACOUSTIC INSTABILITIES. V. Zampaglione (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy), p. 583-592. 5 refs.
- EFFECTIVE CONDUCTIVITY OF AN MHD PLASMA IN A TURBULENT STATE. V. Zampaglione (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy), p. 593-604.
- IONIZATION INSTABILITY IN A BOUNDED REGION [IONIZATSIONNAIA NEUSTOICHIVOST' V OGRANICHENNOI OBLASTI]. A. M. Dykhne (Akademiia Nauk SSSR, Moscow, USSR), p. 605-615.
- GENERATOR DESIGN AND PERFORMANCE STUDIES.
- THE EFFECTIVE OHM'S LAW FOR A NON-HOMOGENEOUS WEAKLY-IONIZED GAS, AND THE HARTMANN PROBLEMS. T. Yamanishi (Ministry of International Trade and Industries, Tokyo, Japan), p. 619-627. 15 refs.
- REDUCED PERFORMANCE OF NON-EQUILIBRIUM LINEAR MHD GENERATORS WITH SEGMENTED ELECTRODES. T. Hiramoto and S. Yano (Japan Atomic Energy Research Institute, Tokai-mura, Ibaraki, Japan), p. 629-641.
- STUDY OF THE ELECTRICAL CONDUCTIVITY OF THE PLASMA IN COAXIAL-TYPE MHD GENERATOR MODELS [ISSLEDOVANIIE ELEKTROPROVODNOSTI PLAZMY V MODELIYAKH MGD-GENE-

RATOROV KOAKSIAL'NOGO TIPA]. M. I. Afanas'ev, V. V. Pirogovskii, Iu. T. Puzynovich, I. I. Sabanskii, A. M. Stolonov, and A. D. Frolov (Nauchno-Issledovatel'skii Institut Elektrofizicheskoi Apparatury, Leningrad, USSR), p. 643-662. 10 refs.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF VORTEX MHD GENERATORS [TEORETICHESKOE I EKSPERIMENTAL'NOE ISSLEDOVANIE VIKHREVIKH MGD-GENERATOROV]. A. I. Bertinov, D. A. But, P. V. Vasiukovich, and V. D. Tsar'kov (Moskovskii Aviatsonnyi Institut, Moscow, USSR), p. 663-681.

INVESTIGATION OF THE BEHAVIOR OF SOME HIGH-MELTING METALLIC MATERIALS IN AN ARGON PLASMA FLOW [ISSLEDOVANIE POVEDENIIA NEKOTORYKH TUGOPLAVKIKH METALLICHESKIKH MATERIALOV V POTOKE ARGONOVOL PLAZMY]. A. Ia. Borisov, I. V. Gorynin, N. N. Gribov, L. I. Emel'ianova, G. I. Kapryin, S. K. Mikhailov, V. L. Popkov, G. V. Sokolova, and Iu. V. Solomko (Tsentral'nyi Nauchno-Issledovatel'skii Institut, Leningrad, USSR), p. 683-696.

INEFFECTIVENESS OF SEGMENTATION IN THE PRESENCE OF STRONG NON-EQUILIBRIUM IONIZATION AND LOCAL SAHA EQUILIBRIUM. M. G. Haines (London, University, Imperial College of Science and Technology, London, England), p. 697-700.

A69-23464

ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k). Vienna, International Atomic Energy Agency, 1968. 611 p. In English, French, and Russian. \$12.

CONTENTS:

FOREWORD. 2 p.

SHOCK WAVES.

THEORETICAL AND EXPERIMENTAL INVESTIGATION OF A NONEQUILIBRIUM PLASMA IN AN MHD CHANNEL. A. Veefkind, J. H. Blom, and L. H. T. Rietjens (Eindhoven, Technische Hogeschool, Eindhoven, Netherlands), p. 711-723. 6 refs.

ELECTRICAL PROCESSES IN A FLOWING PLASMA WITH COLD ELECTRODES. E. Distéfano and N. Fraidenreich (Chile, Universidad, Santiago, Chile), p. 725-732. 5 refs.

FORMATION OF A QUASI-NEUTRAL PLASMA IN A HYDRODYNAMIC CHANNEL FLOW. H. E. Wilhelm (Florida, University, Gainesville, Fla.) and B. Zauderer (General Electric Co., King of Prussia, Pa.), p. 733-744. 10 refs.

THEORETICAL AND EXPERIMENTAL (SHOCK TUBE) STUDY OF THE PHENOMENA ACCOMPANYING THE LOSS OF EQUILIBRIUM IN A CLOSED-CYCLE MHD GENERATOR [ETUDE THEORIQUE ET EXPERIMENTALE, EN TUBE A CHOC, DES PHENOMENES ACCOMPAGNANT LA MISE HORS D'EQUILIBRE DANS UN GENERATEUR MHD EN CYCLE FERME]. J. P. Petit, J. P. Carassa, and J. Valensi (Aix-Marseille, Université, Marseille, France), p. 745-750. 5 refs.

STRUCTURE OF A SUPERSONIC FLOW OF A CONDUCTING GAS IN A TRANSVERSE MAGNETIC FIELD WHEN DRAWING THE INDUCED EMF AND INVESTIGATION OF THE CURRENT-VOLTAGE CHARACTERISTICS [STRUKTURA SVERKHZVUKOVOGO POTOKA PROVODIASHCHEGO GAZA V POPERECHEMOM MAGNITNOM POLE PRI S'EME INDUTSIROVANNOMI EDS I ISSLEDOVANIE VOL'TAMPERNYKH KHARAKTERISTIK]. S. G. Zaitsev, E. V. Lazareva, E. I. Chebotareva, and E. K. Chekalin (Akademii Nauk SSSR, Moscow, USSR), p. 751-776. 7 refs.

NON-EQUILIBRIUM HEATING OF ELECTRONS DURING THE MOTION OF A SHOCK WAVE ACROSS A MAGNETIC FIELD [NERAVNOVESNYI NAGREV ELEKTRONOV PRI DVIZHENII UDARNOI VOLNY CHEREZ MAGNITNOE POLE]. R. V. Vasil'eva, K. D. Donskoi, B. M. Dobrynin, and V. A. Shingarkina (Akademii Nauk SSSR, Leningrad, USSR), p. 777-786. 6 refs.

THE M.I.T. NON-EQUILIBRIUM MHD GENERATOR. J. L. Kerrebrock and M. A. Hoffman (Massachusetts Institute of Technology, Cambridge, Mass.), p. 789-805. 11 refs.

A LARGE-SCALE NON-EQUILIBRIUM MHD GENERATOR. B. Zauderer and E. Tate (General Electric Co., King of Prussia, Pa.), p. 807-824. 15 refs.

HIGH HALL COEFFICIENT EXPERIMENTS IN A LARGE DISC GENERATOR. J. F. Louis (Avco Corp., Everett, Mass.), p. 825-849.

TECHNOLOGICAL ASPECTS OF A TEST STAND FOR MHD [ASPECTS TECHNOLOGIQUES ET CONSTRUCTIFS D'UN BANC D'ESSAI POUR MHD]. E. Fischhoff and P. Zettwoog (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 851-871. 5 refs.

EXPERIMENTAL RESULTS OF MHD CONVERSION USING A RARE GAS [RESULTATS D'EXPERIENCES DE CONVERSION MHD A GAZ RARE]. R. Bertrand, J. C. Coche, J. P. Jacquemin, J. Le Bronec, C. Vavasseur, and P. Zettwoog (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 873-880.

EXPERIMENTAL STUDY ON MHD GENERATORS WITH SEGMENTED ELECTRODES AT HIGH HALL PARAMETERS. S. Yano, T. Hiramoto, and H. Shirakata (Japan Atomic Energy Research Institute, Tokai-mura, Ibaraki, Japan), p. 881-896. 8 refs.

THE TOSHIBA BLOW-DOWN MHD TEST FACILITY, AND EXPERIMENTS ON NON-EQUILIBRIUM IONIZATION. Y. Yamamoto, H. Ogiwara, S. Shioda (Tokyo Shibaura Electric Co., Ltd., Kawasaki, Japan), M. Miyata, M. Goto, and E. Kasahara (Keio University, Tokyo, Japan), p. 897-907. 5 refs.

THE FIRST MEASUREMENTS AT THE ARGAS TEST LOOP. T. Bohn and G. Noack (Kernforschungsanlage Jülich GmbH, Jülich, West Germany), p. 909-923.

CLOSED-CYCLE MPD EXPERIMENTS WITH APPLIED ELECTRIC AND MAGNETIC FIELDS. I. R. McNab, R. Brown (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England), and M. G. Haines (London, University, Imperial College of Science and Technology, London, England), p. 925-933. 17 refs.

EXPERIMENTAL STUDY OF AN MHD GENERATOR MODEL WITH A NONEQUILIBRIUM PLASMA [EKSPERIMENTAL'NOE ISSLEDOVANIE MODELI MGD-GENERATORA S NERAVNOVESNOI PLAZMOI]. N. M. Maslennikov, V. N. Germaniuk, and M. A. Novgorodov (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, USSR), p. 939-955. 6 refs.

SUBSONIC CONSTANT-AREA MHD GENERATOR EXPERIMENTS WITH THE CNEN BLOW-DOWN LOOP FACILITY. E. Bertolini, M. Gasparotto, P. Gay, and R. Toschi (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy), p. 957-986. 9 refs.

PERFORMANCE OF THE CNEN MHD BLOW-DOWN LOOP FACILITY. E. Bertolini, M. Gasparotto, P. Gay, R. Toschi (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy), and R. Brown (Comitato Nazionale per l'Energia Nucleare, Frascati, Italy; International Research and Development Co., Ltd., Newcastle-upon-Tyne, England), p. 987-1015. 6 refs. [See A69-23482 10-11]

DESIGN AND OPERATION OF AN EXPERIMENTAL CLOSED-LOOP MAGNETOPLASMA DYNAMIC ENERGY CONVERSION SYSTEM. E. Talaat (Maryland, University, College Park, Md.), p. 1017-1040. 16 refs.

UNCONVENTIONAL WORKING FLUIDS AND CONCEPTS.

AN IMPULSE INDUCTION MHD GENERATOR HAVING A MAGNETIC FIELD WITH A RADIAL COMPONENT. J. Lego (Vysoká Skola Technická, Prague, Czechoslovakia), p. 1043-1059.

NUCLEAR PROPERTIES OF A REACTOR USED FOR NUCLEAR SEEDING OF AN MHD PLASMA. G. R. Dalton, G. H. Ellis, and D. D. Orvis (Florida, University, Gainesville, Fla.), p. 1061-1078. 8 refs.

THEORETICAL AND EXPERIMENTAL STUDY OF THE EGD POWER GENERATOR. G. Małaczynski and M. P. Brunné (Polska Akademia Nauk, Gdańsk, Poland), p. 1079-1095. 10 refs.

EXPERIMENTS ON A STRIATED-FLOW INDUCTION SYN-

POWER GENERATION EXPERIMENTS.

CHRONOUS MHD GENERATOR. J. Milewski, J. Stańco, and J. Samulski (Polska Akademia Nauk, Gdańsk, Poland), p. 1097-1106. 6 refs.

EXPERIMENT AND THEORY OF THE IONIZATION AND RECOMBINATION KINETICS IN PLASMAS (^3He) PRODUCED THROUGH NEUTRON IRRADIATION. W. H. Ellis, H. E. Wilhelm, G. R. Dalton, H. G. Cofer, and D. D. Orvis (Florida, University, Gainesville, Fla.), p. 1107-1132. 9 refs.

HIGH-TEMPERATURE ENERGY SYSTEMS WITH PLASMA REACTORS AND INDUCTIVE MAGNETOPLASMA DYNAMIC CONVERTERS. W. Peschka and S. Kelm (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart, West Germany), p. 1133-1150. 14 refs.

EXPERIMENTAL WORK ON INDUCTIVE MAGNETOPLASMA DYNAMIC CONVERTERS. W. Peschka, W. Seeger, and H. Eitel (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart, West Germany), p. 1151-1160.

EXPERIMENTAL AND THEORETICAL STUDIES OF GASEOUS SUSPENSIONS OF THERMIONIC EMITTING PARTICLES FOR USE AS MHD WORKING FLUIDS. B. Waldie and I. Fells (Newcastle-upon-Tyne, University, Newcastle-upon-Tyne, England), p. 1161-1172. 16 refs.

CERTAIN ELECTRICAL PROPERTIES OF A DENSE PLASMA [NEKOTORYE ELEKTRICHESKIE SVOISTVA PLOTNOI PLAZMY]. V. A. Alekseev (Akademiia Nauk SSSR, Moscow, USSR), p. 1173-1179. 14 refs.

THE BUILD-UP OF IONIZATION IN A NUCLEAR INDUCED ^3He PLASMA, AT HIGH PRESSURE AND MODERATE TEMPERATURE, SEEDED WITH SILVER AND COPPER. E. Larsson and J. Braun (AB Atomenergi, Nyköping, Sweden), p. 1181-1193.

ELECTRIC CONDUCTIVITY OF A SUPERDENSE PLASMA [ELEKTROPROVODNOST' SVERKHPLOTNOI PLAZMY]. Z. Iankovich (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), p. 1195-1210.

POWER PLANT CONCEPTS AND ECONOMICS.

CONVERSION OF FOSSIL ENERGY INTO ELECTRICITY BY RAPE-GAS MHD [CONVERSION DES ENERGIES FOSSILES EN ELECTRICITE PAR MHD A GAZ RARES]. J. P. Asalbert, R. Scari cabarozzi, C. Vavasseur, and P. Zettwoog (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 1213-1230.

ISENTROPIC OUTPUT OF SEGMENTED-ELECTRODE FARADAY NOZZLES FOR CLOSED-CYCLE OPERATION [RENDIMENT ISENTROPIQUE DES TUYERES DE FARADAY A ELECTRODES SEGMENTEES POUR CYCLE FERME]. J. P. Asalbert and A. Fabart (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 1231-1253.

THERMAL PARAMETERS OF ULTRA-HIGH-TEMPERATURE REACTORS FOR CLOSED-CYCLE NUCLEAR MHD POWER PLANTS. P. V. Gilii (Waagner-Biro AG, Vienna, Austria), p. 1255-1278.

ECONOMIC ASSESSMENT OF A NUCLEAR MHD/STEAM PLANT WITH A SELECTION OF OPERATING PARAMETERS. L. G. Sanders (United Kingdom Atomic Energy Authority, Harwell, Berks., England), p. 1279-1301.

A69-27468

ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 5 - OPEN-CYCLE MHD (Sections 3-f to 3-h). Vienna, International Atomic Energy Agency, 1968. 636 p. In English, French, and Russian. \$12.

CONTENTS:

CHEMICAL CORROSION OF ZIRCONIA-BASED CERAMICS CONSIDERED FOR USE IN MHD GENERATORS [CORROSION CHIMIQUE DE CERAMIQUES A BASE DE ZIRCONIUM ETUDIEES EN VUE DE LEUR APPLICATION AUX GENERATEURS MHD]. A. Dubois, P. Taupin, and J. Sadoune (Compagnie Générale d'Electricité de Paris, Marcoussis, Essonne, France), p. 3003-3017. 8 refs.

THERMAL, ELECTRICAL, AND THERMOELECTRONIC

PROPERTIES OF VARIOUS REFRACTORY OXIDE MATERIALS [PROPRIETES THERMIQUES, ELECTRIQUES ET THERMOELECTRONIQUES DE DIVERS MATERIAUX D'OXYDES REFRACTAIRES]. A. M. Anthony, J. L. Bourgeois, M. Faucher, and J. P. Loup (Centre National de la Recherche Scientifique, Meudon, France), p. 3019-3029.

HIGH-MELTING-POINT OXIDE AND CARBIDE MATERIALS FOR ELECTRODE WALLS OF MHD GENERATORS [TUGOPLAVKIE OKISNYE I KARBIDNYE MATERIALY V ELEKTRODNYKH STEN-KAKH MGD-GENERATOROV]. V. G. Gordon, A. B. Ivanov, B. V. Lukin, V. A. Nikolaeva, V. A. Petrov, A. I. Rekov, V. E. Serebrennikova, E. G. Spiridonov, G. I. Stavrovskii, L. I. Fedotova, and L. P. Fomina (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR), p. 3031-3058. 17 refs.

THERMAL STABILITY OF REFRACTORY CERAMIC MATERIALS IN A HIGH-TEMPERATURE GAS FLOW [TERMOSTOIKOST' OGNEUPORNYKH KERAMICHESKIKH MATERIALOV V VYSOKOTEMPERATURNOM GAZOVOM POTOKE]. V. I. Dauknis, K. A. Kazakovichius, G. A. Prantskiavichius, and V. L. Iurenas (Akademiia Nauk Litovskoi SSR, Institut Fiziko-Tekhnicheskikh Problem Energetiki, Kaunas, Lithuanian SSR), p. 3059-3072. 11 refs.

STUDY ON A SEMI-HOT WALL DUCT FOR MHD GENERATORS. T. Morikawa, Y. Murai, Y. Kobayashi (Mitsubishi Electric Corp., Amagasaki, Japan), M. Ikeda, S. Matsubara (Mitsubishi Heavy Industries, Ltd., Kobe, Japan), T. Hosoda, and M. Kimura (Mitsubishi Metal and Mining Co., Omiya, Japan), p. 3161-3181. 8 refs.

A69-27474

ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2). Vienna, International Atomic Energy Agency, 1968. 793 p. In English, Russian, and French. \$12.

CONTENTS:

FOREWORD. 2 p.

DIAGNOSTICS AND FLUID PROPERTIES.

SPEED OF SOUND AND SHOCK WAVES IN TWO-PHASE FLOWS. H. Städtke (Allgemeine Elektrizitäts-Gesellschaft, Berlin, West Germany), p. 1373-1339. 7 refs. [See A69-27475 13-12]

AN OPTICAL METHOD FOR MEASURING LOCAL PARTICLE VELOCITIES IN TWO-PHASE FLOWS. B. Lehmann (Allgemeine Elektrizitäts-Gesellschaft, Berlin, West Germany), p. 1341-1354. 5 refs.

FLASHING OF SUPERHEATED LIQUID THROUGH CONVERGENT-DIVERGENT NOZZLES. E. Klein (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Berlin, West Germany), p. 1355-1364.

EFFECT OF HIGH-VELOCITY LITHIUM ON STRUCTURAL MATERIALS. L. G. Hays (California Institute of Technology, Pasadena, Calif.), p. 1365-1385. 13 refs. [See A69-27478 13-17]

STUDY OF TWO-PHASE MEDIA FOR USE IN MHD DEVICES [ETUDE DES MILIEUX BIPHASES EN VUE DE LEUR UTILISATION DANS DES DISPOSITIFS MHD]. R. Bidard (Compagnie Electro-Mécanique, Paris, France) and J. Sterlini (Compagnie Electro-Mécanique, Le Bourget, France), p. 1387-1404.

THE EFFECTIVE ELECTRICAL CONDUCTIVITY OF A TWO-PHASE LIQUID-METAL FLOW [EFFEKTIVNAIA ELEKTROPROVODNOST' DVUKHFASNOGO ZHIDKOMETALLICHESKOGO POTOKA]. N. D. Gavrilova, L. D. Dodonov, and I. T. Alad'ev (Akademiia Nauk SSSR, Energeticheskii Institut, Moscow, USSR), p. 1405-1418. 9 refs.

INVESTIGATION OF TWO-PHASE LAVAL NOZZLES [ISSLEDOVANIE DVUKHFASNYKH SOPEL LAVALIA]. I. T. Alad'ev, I. M. Pchelkin, and S. V. Teplov (Akademiia Nauk SSSR, Energeticheskii Institut, Moscow, USSR), p. 1419-1435. 8 refs.

FLUID ACCELERATION.

ENERGY CONVERSION WITH LIQUID-METAL WORKING FLUIDS IN THE MHD-STAUSTRALHROHR. R. Radebold (Allgemeine Elektrizitäts-Gesellschaft, Berlin, West Germany), p. 1439-1461. 9 refs.

INVESTIGATION OF THE LIQUID-METAL MULTI-STAGE INJECTION PROCESS. J. Freund (Berlin, Technische Universität, Berlin, West Germany), p. 1463-1476. 5 refs

THERMAL EFFICIENCIES OF LIQUID-METAL MHD GENERATOR CYCLES. Z. Bayer (Československá Akademie Věd, Prague, Czechoslovakia), p. 1477-1499. 5 refs.

ANALYTICAL AND EXPERIMENTAL STUDIES OF LIQUID-METAL FARADAY GENERATORS. M. Petrick and J. Roberts (Argonne National Laboratory, Argonne, Ill.), p. 1501-1520. 6 refs.

CONDENSING INJECTOR EXPERIMENTS AND ANALYSIS OF PERFORMANCE WITH SUPERSONIC INLET VAPOUR. M. A. Grolmes, M. Petrick, and E. W. Jerger (Argonne National Laboratory, Argonne, Ill.), p. 1521-1544. 19 refs.

THE MECHANISM OF DIFFERENT TYPES OF LOSS IN LIQUID-METAL MHD CYCLES WITH MULTI-STAGE INJECTION. D. Rex (Braunschweig, Technische Hochschule, Braunschweig, West Germany), p. 1545-1561. 5 refs.

SOME RESULTS OF AN INVESTIGATION OF A SINGLE-COMPONENT VERSION OF A LIQUID-METAL MHD ENERGY CONVERTER [NEKOTORYE REZULTATY IZUCHENIA ODNOKOMPONENTNOI SKHEMY ZHDKOMETALLICHESKOGO MGD-PREOBRAZOVANIYA ENERGII]. V. G. Bogomolov, S. D. Dukhovlinov, E. V. Chernykh, and E. M. Shelkov (Akademii Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR), p. 1563-1586. 5 refs.

THERMODYNAMIC ANALYSIS OF NEW LIQUID-METAL MHD-GENERATOR CYCLES [TERMODINAMICHESKII ANALIZ NOVIKH TSIKLOV S ZHDKOMETALLICHESKIM MGD-GENERATOROM]. V. M. Boldyrev, A. E. Morozov, P. O. Orlov, Iu. M. Sias'kin, E. F. Shpil'man, and K. A. Iakimovich (Akademii Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR), p. 1587-1611. 9 refs.

EXPERIMENTAL INVESTIGATION OF A WET-STEAM INJECTOR [EKSPERIMENTAL'NOE ISSLEDOVANIE PAROVODIANOGO INZHEKTORA]. A. P. Sevastianov, E. E. Shpil'man, K. A. Iakimovich (Akademii Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR), V. S. Danilin, M. E. Deich, and G. V. Tsiklauri (Akademii Nauk SSSR, Energeticheskii Institut, Moscow, USSR), p. 1613-1634.

LIQUID-METAL MHD SYSTEMS WITH LAMINAR FLOW AND ELECTRIC POWER GENERATION BY THE SYNCHRONOUS PRINCIPLE [ZHDKOMETALLICHESKIE MGD-SISTEMY SO SLOISTYM POTOKOM I OTBOROM ELEKTRICHESKOI MOSHCHNOSTI PO SINKHRONNOMU PRINTSIPU]. E. T. Bazeev, V. E. Pavlenko, G. M. Shehegolev, L. G. Bezuay, K. I. Kim, and I. M. Postnikov (Akademii Nauk Ukrainoi SSR, Kiev, Ukrainian SSR), p. 1635-1646. 6 refs.

A LIQUID-METAL MHD POWER GENERATION SCHEME USING INTERMITTENT VAPORIZATION. J. W. Bjerklie (Mechanical Technology, Inc., Latham, N.Y.) and J. R. Powell, Jr. (Brookhaven National Laboratory, Upton, N.Y.), p. 1647-1664. 11 refs.

MHD LOSSES.

ELECTRICAL END LOSSES IN LIQUID-METAL MHD GENERATORS WITH VARIABLE CONDUCTIVITY. J. R. Moszynski (Delaware, University, Newark, Del.) and J. C. Agrawal (Purdue University, Lafayette, Ind.), p. 1667-1679. 9 refs.

ONE-DIMENSIONAL CALCULATIONS ON A FINITE-LENGTH MHD INDUCTION GENERATOR. M. Heusinkveld (California, University, Livermore, Calif.), p. 1681-1716. 12 refs.

DEVELOPMENT OF A LIQUID FLOW MHD ALTERNATING CURRENT GENERATOR [DETERMINATION D'UN GENERATEUR ALTERNATIF MHD A VEINE LIQUIDE]. M. Kant and R. Bonnefille (Paris, Université, Fontenay-aux-Roses, Hauts-de-Seine, France), p. 1717-1729. 9 refs.

INDUCTION PHENOMENA IN DC MHD CONVERTERS. P.

Appun and H. Weh (Braunschweig, Technische Hochschule, Braunschweig, West Germany), p. 1731-1744.

SIMULTANEOUS CONSIDERATION OF FINITE LENGTH AND FINITE CHANNEL WIDTH IN MHD INDUCTION CONVERTERS - THE COMPENSATED CONVERTER. H. Weh and G. Woltke (Braunschweig, Technische Hochschule, Braunschweig, West Germany), p. 1745-1761.

END EFFECTS IN MHD CHANNELS WITH NONCONDUCTING VANES [KONTSEVYE EFFEKTY V MGD-KANALAKH S NEPROVODIASHCHIMI PEREGORODKAMI]. I. V. Lavrent'ev (Nauchno-Issledovatel'skii Institut Elektrofizicheskoi Apparatury, Leningrad, USSR), p. 1763-1776. 11 refs.

SOME PROBLEMS IN THE THEORY OF WALL TURBULENCE IN AN INCOMPRESSIBLE CONDUCTING FLUID IN A TRANSVERSE MAGNETIC FIELD AT $Re_m \ll 1$ [NEKOTORYE ZADACHI TEORII PRISTENOCHNOI TURBULENTNOSTI V NESZHIMAEMOI PROVODIASHCHEI ZHDKOSTI V POPERECHNOM MAGNITNOM POLE PRI $Re_m \ll 1$]. A. S. Pleshakov (Akademii Nauk SSSR, Energeticheskii Institut, Moscow, USSR), p. 1777-1788. 7 refs.

MERCURY FLOW WITH A HYDRAULIC SHOCK IN A CHANNEL SITUATED IN A TRANSVERSE MAGNETIC FIELD [TECHENIE RTUTI S GIDRAVLICHESKIM PRYZHKOM V LOTKE V POPERECHNOM MAGNITNOM POLE]. L. A. Vulis, K. E. Dzhaugashtin, and V. T. Iaglenko (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR), p. 1791-1799.

TRANSITION CRITERIA AND TURBULENT FLOWS IN MHD CHANNELS [KRITERII PEREKHODA I TURBULENTNYE TECHENIYA V MAGNITOGIDRODINAMICHESKIKH KANALAKH]. G. G. Branover (Akademii Nauk Latvii SSR, Riga, Latvian SSR), p. 1801-1814. 14 refs.

EXPERIMENTAL VELOCITY PROFILE DETERMINATIONS IN MHD FLOW THROUGH A DIELECTRIC CIRCULAR CHANNEL. A. L. Loeffler, Jr., A. Maciulaitis, and M. Hoff (Grumman Aircraft Engineering Corp., Bethpage, N.Y.), p. 1815-1831. 12 refs.

GENERATOR DESIGN AND PERFORMANCE STUDIES.

HIGH-FREQUENCY VARIABLE FLUID AND VARIABLE FIELD VELOCITY MHD GENERATOR. L. L. Prem (North American Rockwell Corp., Canoga Park, Calif.), p. 1835-1857.

PERFORMANCE CAPABILITIES OF LIQUID-METAL MHD INDUCTION GENERATORS. D. G. Elliott (California Institute of Technology, Pasadena, Calif.), p. 1859-1877. 6 refs.

THE OPTIMIZATION OF MHD INDUCTION CONVERTERS. W. Peschka, C. Carpetis, and A. Gann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart, West Germany), p. 1879-1889.

CYLINDRICALLY CONSTRUCTED MHD INDUCTION CONVERTERS. H. Weh and P. Appun (Braunschweig, Technische Hochschule, Braunschweig, West Germany), p. 1891-1906.

ELEMENTS OF THE GENERAL TRANSIENT-RESPONSE THEORY OF LIQUID-METAL CONDUCTION MHD GENERATORS [ELEMENTY OBSHCHEI TEORII PEREKHODNYKH REZHIMOV RABOTY ZHDKOMETALLICHESKIKH MGD-GENERATOROV KONDUKTSIONNOGO TIPA]. A. N. Patrashev, A. G. Riabinin, and A. I. Khozhainov (Akademii Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR), p. 1907-1933. 16 refs.

OPTIMAL GEOMETRICAL RELATIONS IN A COAXIAL LINEAR INDUCTION MHD GENERATOR [OPTIMAL'NYE GEOMETRICHESKIE SOOTNOSHENIYA V KOAKSIAL'NOM LINEINOM INDUKTSIONNOM MGD-GENERATORE]. N. M. Okhremenko and A. G. Chepovetskii (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Elektromaterialov, Leningrad, USSR), p. 1935-1963. 7 refs.

RAYLEIGH-TAYLOR INSTABILITY AND METHODS OF STABILIZING IT IN SYNCHRONOUS LIQUID-METAL MHD GENERATORS [NEUSTOICHIVOST' RELEIA-TEILORA V ZHDKOMETALLICHESKIKH SINKHRONNYKH MGD-GENERATORAKH I SPOSOBY EE STABILIZATSII]. K. I. Kim (Akademii Nauk Ukrainoi SSR, Kiev, Ukrainian SSR), p. 1965-1975. 7 refs.

01 ENERGY SYSTEMS

GENERATOR EXPERIMENTS - POWER PLANT CONCEPTS AND ECONOMICS.

EXPERIMENTAL RESULTS WITH A LIQUID-METAL MHD INDUCTION CONVERTER. M. Ulber and T. Schulz (Allgemeine Elektrizitäts-Gesellschaft, Berlin, West Germany), p. 1979-2004.

FLUID-METAL MHD/STEAM BINARY PLANT ECONOMY FOR CENTRAL STATIONS. L. L. Prem (North American Rockwell Corp., Canoga Park, Calif.), p. 2005-2018.

CIRCULATION OF LIQUIDS FOR MHD POWER GENERATION. D. J. Cerini (California Institute of Technology, Pasadena, Calif.), p. 2019-2033.

INVESTIGATION OF A LIQUID-METAL JET MHD GENERATOR [ISSLEDOVANIYE ZHIDKOMETALLICHESKOGO STRUINOGO MGD-GENERATORA]. K. I. Dmitriyev, E. A. Zotova, I. A. Ivanov, V. S. Presniakov, and F. R. Ulinich (Akademiya Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR), p. 2035-2046.

EXPERIMENTAL INVESTIGATION OF LIQUID-METAL MHD GENERATORS [EKSPERIMENTAL'NYYE ISSLEDOVANIYA ZHIDKOMETALLICHESKIKH MGD-GENERATOROV]. G. A. Baranov, V. F. Vasil'ev, V. A. Glukhikh, V. G. Karasev, I. R. Kirillov, and I. V. Lavrent'ev (Nauchno-Issledovatel'skii Institut Elektrofizicheskoi Apparatury, Leningrad, USSR), p. 2047-2064.

INVESTIGATION OF A LIQUID-METAL INDUCTION MHD GENERATOR [ISSLEDOVANIYE ZHIDKOMETALLICHESKOGO MGD-GENERATORA INDUKTSIONNOGO TIPA]. Yu. A. Bakanov, L. M. Dronnik, V. E. Strizhak, I. M. Tolmach, and E. I. Iantovskii (Akademiya Nauk SSSR, Energeticheskii Institut, Moscow, USSR), p. 2065-2083. 7 refs

A69-28021

ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 4 - OPEN-CYCLE MHD (Sections 3-a to 3-e).

Vienna, International Atomic Energy Agency, 1968. 760 p. In English, French, and Russian. \$12.

CONTENTS:

FOREWORD. 2 p.

THERMAL RADIATION OF POTASSIUM IN GASES USED IN MAGNETOHYDRODYNAMICS [RAYONNEMENT THERMIQUE DU POTASSIUM DANS LES GAZ UTILISES EN MAGNETOHYDRODYNAMIQUE]. A. Feugier and X. Nguyen Duc (Institut Français du Pétrole, Rueil-Malmaison, Hauts-de-Seine, France), p. 2119-2128. 15 refs.

STUDY OF VARIOUS METHODS OF DETERMINING THE PLASMA TEMPERATURE IN AN MHD-GENERATOR DUCT [ISSLEDOVANIYA RAZLICHNYKH METODOV OPREDELENIA TEMPERATURY PLAZMY V KANALE MGD-GENERATORA]. S. Suckewer, Ia. Litiski, B. Mizera, and P. Żelazny (Polska Akademia Nauk, Warsaw, Poland), p. 2179-2194. 5 refs.

CALCULATION OF THE SHEAR STRESS AND THE VELOCITY PROFILE IN AN MHD DUCT [CALCUL DE LA CONTRAINTE DE CISAILEMENT ET DU PROFIL DE VITESSE DANS UNE TUYERE MHD]. C. Karr (Institut Français du Pétrole, Rueil-Malmaison, Hauts-de-Seine, France), p. 2335-2345. 5 refs.

EVOLUTION OF THE BOUNDARY LAYER IN THE VICINITY OF THE WALLS OF A MAGNETOAERODYNAMIC GENERATOR [EVOLUTION DE LA COUCHE LIMITE AU VOISINAGE DES PAROIS D'UN GENERATEUR MAGNETOAERODYNAMIQUE]. J. C. Brancher and B. Roy (Compagnie Générale d'Electricité de Paris, Paris, France), p. 2347-2365. 7 refs.

MEASUREMENT AND ANALYSIS OF THE TENSOR CONDUCTIVITY OF GASES ALONG THE AXIS OF A LOW-POWER MHD DUCT [MESURE ET ANALYSE DE LA CONDUCTIVITE TENSORIELLE DES GAZ LE LONG DE L'AXE D'UNE TUYERE MHD DE PETITE PUISSANCE]. A. Kordus (Poznań, Politechnika, Poznań, Poland), p. 2367-2376. 9 refs.

CALCULATION OF THE UNSTEADY FLOW OF A CONDUCTING GAS IN AN MHD GENERATOR DUCT [RASCHET NESTATSIONARNOGO TECHENIYA PROVODYASHCHEGO GAZA V KANALE MGD-GENERATORA]. G. R. Alavidze (Akademiya Nauk SSSR, Moscow, USSR) and V. M. Paskonov (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), p. 2407-2423. 8 refs.

CALCULATION OF THE BOUNDARY LAYER AT THE ELECTRODE OF AN MHD GENERATOR OF VARIABLE CROSS SECTION [RASCHET POGRANICHNOGO SLOIA NA ELEKTRODE MGD-GENERATORA PEREMENNOGO SECHENIYA]. A. E. Iakubenko (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), p. 2425-2437.

ELECTRIC-FIELD FLUCTUATIONS IN WEAKLY IONIZED PLASMA FLOWS [O FLUKTUATSIYAKH ELEKTRICHESKOGO POLIA V POTOKAKH SLABOIONIZOVANNOI PLAZMY]. E. L. Borblik, R. V. Ganefel'd, and E. P. Strashinin (Akademiya Nauk Ukrainnoi SSR, Kiev, Ukrainian SSR), p. 2467-2479. 7 refs.

THE ELECTRIC FIELD IN AN MHD DUCT WITH PERMEABLE ELECTRODES WHEN THE HALL EFFECT IS PRESENT IN THE FLOW OF THE MOVING MEDIUM [ELEKTRICHESKOE POLE V MGD-KANALE S PRONITSYAEMYMI ELEKTRODAMI PRI NALICHII EFFEKTA KHOLLA V POTOKE DVIZHUSHCHEISIA SREDY]. Yu. P. Emets and L. L. Panasevich (Akademiya Nauk Ukrainnoi SSR, Kiev, Ukrainian SSR), p. 2481-2492. 12 refs.

THE LAMINAR MAGNETOGASDYNAMIC ELECTRODE BOUNDARY LAYER OF A THERMAL NON-EQUILIBRIUM PLASMA. H. A. Claassen (Kernforschungsanlage Jülich GmbH, Jülich, West Germany), p. 2493-2508. 11 refs.

EXPERIMENTAL WORK ON INHOMOGENEOUS FLOWS [TRAVAUX EXPERIMENTAUX SUR LA VENE INHOMOGENE]. R. Devime (Institut Français du Pétrole, Rueil-Malmaison, Hauts-de-Seine, France), H. Lecroart, J. P. Malplat, R. Pochard, and R. Porte (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 2511-2526. 8 refs.

RAYLEIGH-TAYLOR INSTABILITIES IN MAGNETOHYDRODYNAMICS [INSTABILITES DE RAYLEIGH-TAYLOR EN MAGNETOHYDRODYNAMIQUE]. X. Nguyen Duc and A. Lemarquand (Institut Français du Pétrole, Rueil-Malmaison, Hauts-de-Seine, France), p. 2527-2533.

RESULTS OF TESTS ON A SUPERSONIC MAGNETOAERODYNAMIC CONVERSION RIG [RESULTATS D'ESSAIS SUR BANC DE CONVERSION MAGNETOAERODYNAMIQUE SUPERSONIQUE]. J. C. de Simone, J. C. Brancher, and D. Parizot (Compagnie Générale d'Electricité de Paris, Paris, France), p. 2743-2759.

A69-39477

ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 6-INVITED LECTURE, RAPORTEURS' STATEMENTS AND DISCUSSIONS, ROUND TABLE DISCUSSIONS, INDEXES.

Vienna, International Atomic Energy Agency, 1968. 477 p. \$12.

CONTENTS:

FOREWORD. 2 p.

SUPERCONDUCTING MAGNETS FOR MHD GENERATORS. Z. J. J. Stekly (Avco Corp., Everett, Mass.), p. 3467-3489. 17 refs.

STEADY-STATE NON-EQUILIBRIUM IONIZATION. M. Gryziński (Polska Akademia Nauk, Świerk, Poland), p. 3501-3515. 17 refs.

FIELDS AND FLOW IN MHD CHANNELS. L. L. Lengyel (Institut für Plasmaphysik GmbH, Garching, West Germany), p. 3539-3553. 20 refs.

INSTABILITIES. G. A. Kasabov (Akademiya Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR), p. 3555-3561. 16 refs.

SHOCK WAVES. B. Zauderer (General Electric Co., King of

Prussia, Pa.), p. 3573-3589. 12 refs.

MHD LOSSES. H. Weh (Braunschweig, Technische Hochschule, Braunschweig, West Germany), p. 3693-3708. 22 refs.

AUTHOR INDEX, p. 3922-3927.

A71-12120 Technology assessment. I - Weighing the benefits and risks of new technologies. Chauncey Starr (California, University, Los Angeles, Calif.). *Research Management*, vol. 13, Nov. 1970, p. 409-425.

Discussion of an approach to quantitative assessments of social benefits vs social costs of technological developments in use. Specific assessments made or attempted include mining accident rates vs incentive, risk and participation trends for motor vehicles, certified air carriers, and general aviation, electric power generating nuclear plants. Although this study is only exploratory, it does reveal certain interesting points. Public acceptability of risk appears to be crudely proportional to the cube of the benefits (real or imagined). The social acceptance of risk is directly influenced by public awareness of the benefits of an activity, as determined by advertising, usefulness, and the number of people participating. In a sample application of these criteria to atomic power plant safety, it developed that an engineering design objective determined by economic criteria resulted in a design target risk level very much less than the present socially accepted risk for electric power plants. M.V.E.

A71-13026 Power Sources Symposium, 24th, Atlantic City, N.J., May 19-21, 1970, Proceedings. Symposium sponsored by the U.S. Army. Red Bank, N.J., PSC Publications Committee, 1970. 228 p. \$15.

Contents:

Session on secondary batteries.

Nickel-cadmium batteries for the Orbiting Astronomical Observatory spacecraft-II (OAO). F. E. Ford and T. J. Henningan (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 1-4.

Chemical analysis of nickel-cadmium electrodes. H. H. Kroger and A. J. Catotti (General Electric Co., Gainesville, Fla.), p. 4-6.

Design, testing and flight performance of the Mariner Mars 1969 spacecraft batteries. S. J. Krause (California Institute of Technology, Pasadena, Calif.), p. 7-10.

High energy density, long life Zn-AgO secondary battery BB-534(1)/U. E. J. Settembre (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 10-13.

Zinc as a secondary battery electrode. T. P. Dirks (Calvin College, Grand Rapids, Mich.), p. 14, 15.

Physical changes at lithium electrodes during charge-discharge cycling. D. E. Semones and J. McCallum (Battelle Memorial Institute, Columbus, Ohio), p. 16-19.

Solid state energy storage device. J. E. Oxley (Gould Ionics, Inc., Canoga Park, Calif.), p. 20-23. 6 refs.

Session on fuse power sources.

Solid electrolyte batteries with modified AgI electrolyte. D. M. Smyth, C. H. Tompkins, Jr., and S. D. Ross (Sprague Electric Research and Development Center, North Adams, Mass.), p. 24-26. 7 refs.

A new high energy density solid electrolyte cell with a lithium anode. A. A. Schneider, J. R. Moser, T. H. E. Webb, and J. E. Desmond (Catalyst Research Corp., Baltimore, Md.), p. 27-30. 9 refs.

Reserve battery electrodes using bonded active materials. T. J. Kilduff and E. F. Horsey (U.S. Army, Harry Diamond Laboratories, Washington, D.C.), p. 30-35.

A one-dollar power supply for proximity fuses. F. G. Turrill (U.S. Army, Harry Diamond Laboratories, Washington, D.C.) and W. C. Kirchberger (Globe-Union, Inc., Milwaukee, Wis.), p. 36-39.

Reserve battery requiring two simultaneous forces for activation. A. M. Biggar (U.S. Army, Harry Diamond Laboratories, Washington, D.C.), p. 39-41.

The fluidic generator - A new electrical power source. C. J. Campagnuolo and R. W. Gotton (U.S. Army, Harry Diamond Laboratories, Washington, D.C.), p. 42-45.

Session on thermal energy conversion.

Manpack thermoelectric generator. J. P. Angello and S. J. Shapiro (U.S. Army, Electronic Components Laboratory, Fort Monmouth, N.J.), p. 46-50.

Reciprocating Rankine cycle engine developments. E. F. Doyle, R. J. Raymond, and T. LeFeuvre (Thermo Electron Corp., Waltham, Mass.), p. 51-54.

Organic Rankine cycle power system performance and status. M. W. Reck and R. W. Niggemann (Sundstrand Corp., Rockford, Ill.), p. 55-61.

Status report on Snap 27. A. A. Pitrola (General Electric Co., New York, N.Y.), p. 61-65.

Session on requirements for power sources.

DOD. J. E. Griffin (U.S. Department of Defense, Alexandria, Va.), p. 66-68.

U.S. Army. M. Aiken (U.S. Army, Materiel Command, Washington, D.C.), p. 68-70.

U.S. Navy. G. B. Ellis (U.S. Navy, Underwater Weapons Research and Engineering Station, Newport, R.I.), p. 70-72.

U.S. Air Force. W. S. Bishop (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio), p. 72-75.

NASA. F. Schulman (NASA, Washington, D.C.), p. 75-77.

U.S. Department of Transportation. R. L. Strombotne (U.S. Department of Transportation, Washington, D.C.), p. 77-79.

Session on primary batteries.

Low temperature mercury-cadmium batteries. W. N. Carson, Jr. and R. N. King (GE Research and Development Center, Schenectady, N.Y.), p. 80-82.

Low temperature mercury-zinc batteries. S. J. Angelovich, R. DiPalma, and C. W. Fleischmann (Mallory Battery Co., Tarrytown, N.Y.), p. 82-85. 11 refs.

Field experience with magnesium batteries. A. J. Legath (U.S. Army, Electronic Components Laboratory, Fort Monmouth, N.J.), p. 85-88.

Low cost oxygen electrodes. J. E. Wynn and H. Knapp (U.S. Army, Electronic Components Laboratory, Fort Monmouth, N.J.), p. 88-91. 7 refs.

Air electrodes for mechanically rechargeable zinc-air-batteries. R. E. Biddick, W. J. Cummins, and R. Rubischko (Gould, Inc., Minneapolis, Minn.), p. 92-94.

Water activated zinc-air batteries. C. A. Nordell (U.S. Army, Electronic Components Laboratory, Fort Monmouth, N.J.), p. 94-98.

Lithium-nickel sulfide batteries. R. Jasinski, L. Gaines, G. Hansen, and S. Carroll (Tyco Laboratories, Inc., Waltham, Mass.), p. 98-100.

Semiconductor cathodes for high energy batteries. M. M. Nicholson (North American Rockwell Corp., Canoga Park, Calif.), p. 101-103. 15 refs.

A heat sterilizable remotely activated battery. W. von Hartmann (California Institute of Technology, Pasadena, Calif.), p. 104-107.

Magnesium anodes alloyed with lead and mercury. R. H. Williams (Sparton Electronics, Jackson, Mich.), p. 108-111.

ZnAgO reserve batteries. W. Payne (Eagle-Picher Industries, Inc., Joplin, Mo.), p. 112-114.

Session on power processing.

Power transistor stability and reliability. D. Navon (Massachusetts University, Amherst, Mass.), p. 115-117.

Capacitor energy storage improvement by means of heat pipe. E.

01 ENERGY SYSTEMS

- Reimers (U.S. Army, Mobility Equipment Research and Development Center, Fort Belvoir, Va.), p. 118-122.
- Effect of requirement specification on implementation of a power processor. J. J. Biess and A. D. Schoenfeld (TRW Systems Group, Redondo Beach, Calif.), p. 123-128.
- Simplified nondissipative regulation using unconventional magnetic-amplifier techniques. E. T. Moore (Wilmore Electronics Co., Inc., Durham, N.C.), p. 128-131.
- Series commutation for variable frequency thyristor inverters. J. J. Wawzonek (Base Corp., Natick, Mass.), p. 131-136.
- Regulated energy transfer by inductor-transformers with single and multiple stages. S. J. Lindena (Electro-Optical Systems, Inc., Pasadena, Calif.), p. 137-141.
- Advanced techniques of spacecraft electrical power transformation and control. F. C. Yagerhofer (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 141-144.
- High voltage supply for NASA orbital workshop electrostatic workbench. C. E. Thomas (Chrysler Corp., New Orleans, La.), p. 145-148.
- High-voltage supplies. R. Severns (Analog Technology Corp., Pasadena, Calif.), p. 148-152.
- Improved power conversion technique through multi-phase DC-chopper motor drive. E. Reimers (U.S. Army, Mobility Equipment Research and Development Center, Fort Belvoir, Va.), p. 152-159.
- Application of solid state motor speed controls for air conditioner. J. D. Gillett (Electric Machinery Manufacturing Co., Garland, Tex.), p. 160-163.
- Optimization of high-speed homopolar alternators as static frequency converter supplies. K. F. Schenk (Colorado, University, Boulder, Colo.) and A. L. Joki (U.S. Army, Mobility Equipment Research and Development Center, Fort Belvoir, Va.), p. 163-167. 5 refs.
- Nonlinear vector potential analysis of homopolar inductor alternators. K. F. Schenk, E. A. Erdelyi (Colorado, University, Boulder, Colo.), and R. E. Hopkins (U.S. Army, Mobility Equipment Research and Development Center, Fort Belvoir, Va.), p. 168-171.
- Session on fuel cells.**
- Catalytic factors in direct hydrocarbon oxidation. J. Giner, J. M. Parry, and S. M. Smith (Tyco Laboratories, Inc., Waltham, Mass.), p. 172-175.
- Oxide bronzes as possible catalysts for oxygen reduction in batteries and fuel cells. R. A. Fredlein and J. McHardy (Pennsylvania, University, Philadelphia, Pa.), p. 175-178. 11 refs.
- Corrosion resistant materials for acid electrolyte fuel cells. II. R. R. Sayano (TRW Systems Group, Redondo Beach, Calif.), R. A. Mendelson, E. T. Seo, and H. P. Silverman (TRW, Inc., Cleveland, Ohio), p. 178-182.
- Studies on the phosphoric acid matrix cell. O. J. Adhart (Engelhard Minerals and Chemicals Corp., Newark, N.J.), p. 182-185.
- Sputtered fuel cell electrodes. J. S. Batzold and W. J. Asher (Esso Research and Engineering Co., Linden, N.J.), p. 185-188.
- Electrolyte regeneration in alkaline fuel cells. L. M. Handley and A. P. Meyer (United Aircraft Corp., South Windsor, Conn.), p. 188-192.
- Hydrogen regeneration through improved steam reforming. R. E. Engdahl and A. J. Cassano (Energy Research Corp., Inc., Bethel, Conn.), p. 192-194.
- DSSV fuel cell power systems. J. A. Woerner, J. H. Harrison (U.S. Navy, Naval Ship Research and Development Laboratory, Annapolis, Md.), and D. M. Spadone (U.S. Navy, Deep Submergence Systems Project Office, Bethesda, Md.), p. 195-197.
- Methanol-oxygen fuel cells. J. E. Wynn (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 198-201.
- Experience with hydrazine fuel cells in SEA. F. G. Perkins (U.S. Army, Mobility Equipment Research and Development Center, Fort Belvoir, Va.), p. 202-204.
- Evolution of replaceable hydrazine module as a basic building block. R. E. Salathe (Whiteley Industries, Inc., Melrose, Mass.), p. 204-207.
- Optimization of hydrazine-air cells. K. V. Kordesch and M. B. Clark (Union Carbide Corp., Cleveland, Ohio), p. 207-210.
- Hydrazine fuel cells. L. C. Hymes, J. E. Ward, and G. L. Reed (Allis-Chalmers, Greendale, Wis.), p. 210-213.
- A71-21300 # Optimization methods for jet-propulsion with respect to exergy.** L. Narjes (Indian Institute of Technology, Madras, India). *Aeronautical Society of India, Journal*, vol. 22, Nov. 1970, p. 209-217. 6 refs.
- The paper deals with two optimization procedures by introducing the thermodynamic concepts of exergy and anergy. From purely thermodynamic considerations, the first part of the analysis leads to minimum specific fuel consumption or minimum specific exergy loss which corresponds to maximum thermodynamic efficiency. The second takes into account both capital investment and expenses due to exergy need (or fuel consumption) of the unit. This leads to minimum total cost flux or an economically optimum unit. The optimum conditions are achieved by varying the compressor pressure ratio of the unit in both cases. The results calculated on the basis of adiabatic, incomplete combustion from experimental observations on a furnace burning heavy oil used for steam generation are compared with the results of adiabatic and complete combustion in jet engine combustion chambers. (Author)
- A71-22179 * # Nuclear power for surface effect vehicle and aircraft propulsion.** Frank E. Rom (NASA, Lewis Research Center, Cleveland, Ohio). *American Institute of Aeronautics and Astronautics, Annual Meeting, 7th, Houston, Tex., Oct. 19-22, 1970, Paper 70-1221*. 22 p. 8 refs.
- Preliminary results of an economic study that indicates the potential application of nuclear surface effect vehicles and aircraft for carrying transoceanic commerce in the post 1980 time period are presented. A summary of recent encouraging mobile nuclear reactor safety experiments for high speed impacts is also presented. The results of the economic study indicate that there would be a potential need for about 1500 nuclear surface effect vehicles of 10,000 tons gross weight with a speed of 100 knots to handle transoceanic commerce if the shipping cost would be about 1 to 2 cents per ton mile. The study indicates that nuclear powered surface effect vehicles may have the ability to carry cargo at rates less than 2 cents per ton mile. Subsonic nuclear aircraft with a gross weight of 1000 tons may be able to carry cargo at the rate of 4 to 5 cents per ton mile. Very large subsonic nuclear aircraft of the order of 10,000 tons in gross weight may be able to carry cargo at rates less than 2 cents per ton mile. It would take a fleet of 500 such aircraft to handle transoceanic trade that would be economically feasible to carry at 1 to 2 cents per ton mile in 1980. (Author)
- A71-27542 Economics of propulsion systems for air transport.** I. David Huddie. *Esso Air World*, vol. 23, no. 4, 1971, p. 91-96.
- Outline of reasons for producing new powerplants and the contributions made by powerplant efficiency and size to aircraft operating economics. The continued growth in aircraft size obliges the engine constructor to develop larger engines. At the same time the need for lower weight and lower fuel consumption to stave off square-cube effects, and social pressures for less nuisance from aircraft (noise and air pollution) demand more advanced designs. Provided that the advance in technology continues to allow this process to occur with each new generation of aircraft there seems to be no reason why transport aircraft should not continue to increase in size since there is no intrinsic natural limit to the size of turbomachinery. F.R.L.
- A72-43147 # The impact of aerospace technology on energy conversion in the 70's.** S. I. Freedman (Pennsylvania, University,

Philadelphia, Pa.). *American Society of Mechanical Engineers, Aerospace Conference, Anaheim, Calif., Sept. 10-13, 1972, Paper 72-Aero-11*. 4 p. Members, \$1.00; nonmembers, \$3.00.

The author discusses areas in which energy conversion is contributing to the functioning of industrialized society by developing new systems. He describes the relationships between the systems, the various disciplines which form the elements of energy conversion, and several of the aerospace programs which advanced technical capabilities in these areas. (Author)

A72-45216 # On the economics of space utilization. G. R. Woodcock (Boeing Co., Aerospace Group, Seattle, Wash.). *International Astronautical Federation, International Astronautical Congress, 23rd, Vienna, Austria, Oct. 8-15, 1972, Paper*. 26 p. 34 refs.

An economical analysis is conducted for assessing potential future developments in space. Particular attention is given to commercial applications. The demand for space-derived services in conventional applications is expected to grow. More and better meteorological satellites will be needed. Equipment is required for the determination of temperature, humidity, and pressure as a function of altitude in connection with endeavors to improve numerical weather prediction capabilities. Aspects of space communications are discussed together with problems of nuclear waste disposal and questions of manufacturing in space. Other applications considered are related to space solar power and the extension of human civilization beyond the confines of the earth. G.R.

A73-15741 # Hydrogen resistojets for primary propulsion of communications satellites. W. T. Lord, R. C. Parkinson, K. Allen, J. A. Donovan, and P. J. Sherwood (Rocket Propulsion Establishment, Westcott, Bucks., England). In: *Electric propulsion and its space applications; Workshop, 2nd, Toulouse, France, June 21-23, 1972, Proceedings*. Toulouse, Centre National de la Recherche Scientifique, 1972, p. 381-399. 11 refs.

The first part of the paper describes the RPE 3-kW hydrogen resistojets and gives a summary of its fabrication processes and the test results obtained to date. The performance of this resistojets is designed to be suitable for application in a primary electric propulsion system for geostationary communications satellites. The second part of the paper describes how, by combining hydrogen resistojets with ion motors, it is possible to obtain a mixed-thruster electric propulsion system which enables a desirable balance to be obtained between payload and transfer time and between power supply and propellant mass. Versatility of performance is accompanied by flexibility of operation, and the introduction of two separate propulsion devices need not necessarily have an adverse effect on reliability. (Author)

A73-17608 * # Toward a second-generation supersonic transport. L. K. Loftin, Jr. (NASA, Langley Research Center, Hampton, Va.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 9th, Washington, D.C., Jan. 8-10, 1973, Paper 73-15*. 11 p. Members, \$1.50; nonmembers, \$2.00.

A number of promising avenues of research and development are considered in relation to an advanced supersonic transport which has improved range/payload characteristics and lower airport noise and sonic boom than current-generation supersonic transports. The prospects for advanced technology suggest that a high lift-to-drag-ratio configuration incorporating advanced materials and control concepts and utilizing a variable-cycle engine or perhaps an advanced dry turbojet, will yield an advanced supersonic transport which is economically viable and socially acceptable. Hydrogen fuel offers great promise for future supersonic aircraft, however, the formidable problems associated with the use of such fuel probably precludes its use on any near term second-generation supersonic transport. The state of technology in some of the areas discussed is not very far advanced and, consequently, a major effort will be required to bring these technologies to a state of readiness on a timely basis. (Author)

A73-17631 * # Key technology for airbreathing hypersonic aircraft. A. L. Nagel and J. V. Becker (NASA, Langley Research Center, Hampton, Va.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 9th, Washington, D.C., Jan. 8-10, 1973, Paper 73-58*. 12 p. 9 refs. Members, \$1.50; nonmembers, \$2.00.

This paper reviews recent progress in the key hypersonic technologies, which has been good despite a relatively low priority. Successful hypersonic research engine tests have been made. Active cooling system analyses have shown potential for weight savings, alleviation of structural design problems, and long airframe life. Maturing computerized flow field theories permit optimizing engine-airframe performance. Adequate progress in the future requires an expanded technology program emphasizing hydrogen usage. A hydrogen fueled hypersonic research airplane is essential, providing critical flight data and operational experience. (Author)

A73-22830 * Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft. R. D. Witcofski (NASA, Langley Research Center, Hampton, Va.). In: *Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings*. Washington, D.C., American Chemical Society, 1972, p. 1349-1354. 19 refs.

A73-34435 * # Hypersonic transports - Economics and environmental effects. R. H. Petersen and M. H. Waters (NASA, Ames Research Center, Aeronautical Missions and Technology Branch, Moffett Field, Calif.). *Journal of Aircraft*, vol. 10, June 1973, p. 334-341. 27 refs.

An economic analysis of hypersonic transports is presented to show projected operating costs (direct and indirect) and return on investment. Important assumptions are varied to determine the probable range of values for operating costs and return on investment. The environmental effects of hypersonic transports are discussed and compared to current supersonic transports. Estimates of sideline and flyover noise are made for a typical hypersonic transport, and the sonic boom problem is analyzed and discussed. Since the exhaust products from liquid hydrogen-fueled engines differ from those of kerosene-fueled aircraft, a qualitative assessment of air pollution effects is made. (Author)

A73-35469 * # The use of hydrogen for aircraft propulsion in view of the fuel crisis. S. Weiss (NASA, Lewis Research Center, Aerospace Safety Research and Data Institute, Cleveland, Ohio). *NASA Research and Technology Advisory Committee on Aeronautical Operating Systems, Meeting, Ames Research Center, Moffett Field, Calif., Mar. 7, 8, 1973, Paper*. 37 p. 73 refs.

In view of projected decreases in available petroleum fuels, interest has been generated in exploiting the potential of liquid hydrogen (LH2) as an aircraft fuel. Cost studies of LH2 production show it to be more expensive than presently used fuels. Regardless of cost considerations, LH2 is viewed as an attractive aircraft fuel because of the potential performance benefits it offers. Accompanying these benefits, however, are many new problems associated with aircraft design and operations; for example, problems related to fuel system design and the handling of LH2 during ground servicing. Some of the factors influencing LH2 fuel tank design, pumping, heat exchange, and flow regulation are discussed. (Author)

A73-38373 * # Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues. F. S. Kirkham and C. Driver (NASA, Langley Research Center, Hampton, Va.). *American Institute of Aeronautics and Astronautics, Aircraft Design, Flight Test and Operations Meeting, 5th, St. Louis, Mo., Aug. 6-8, 1973, Paper 73-809*. 11 p. 10 refs. Members, \$1.50; nonmembers, \$2.00.

The performance of hydrogen-fueled commercial aircraft is

01 ENERGY SYSTEMS

examined in the subsonic, supersonic, and hypersonic speed regime and compared with JP-fueled systems. Hydrogen aircraft are shown to provide substantial improvements in range and payload fraction as well as to minimize or eliminate many environmental problems. The major elements of a development program required to make hydrogen-fueled aircraft a commercial reality are also outlined and the rationale for and characteristics of both a subsonic demonstrator and a high speed research airplane are described. (Author)

A73-43499*# Potential of hydrogen fuel for future air transportation systems. W. J. Small, D. E. Fetterman, and T. F. Bonner, Jr. (NASA, Langley Research Center, Hampton, Va.). *Intersociety Conference on Transportation, 2nd, Denver, Colo., Sept. 23-27, 1973, ASME Paper 73-ICT-104.* 11 p. 26 refs. Members, \$1.00; nonmembers, \$3.00.

Recent studies have shown that hydrogen fuel can yield spectacular improvements in aircraft performance in addition to its more widely discussed environmental advantages. The characteristics of subsonic, supersonic, and hypersonic transport aircraft using hydrogen fuel are discussed, and their performance and environmental impact are compared to that of similar aircraft using conventional fuel. The possibilities of developing hydrogen-fueled supersonic and hypersonic vehicles with sonic boom levels acceptable for overland flight are also explored. (Author)

N68-10726 Joint Publications Research Service, Washington, D. C.

NUCLEAR ENERGY INSTALLATIONS AND THEIR TECHNICAL POSSIBILITIES

A. I. Leypunskiy 7 Nov. 1967 12 p Transl. into ENGLISH from *Kernenergie* (Dresden), v. 10, no. 6, Jun. 1967 p 177-181 Presented at the Gen. Conf. of the Intern. Atomic Energy Organ., Vienna, 23 Sep. 1966

(JPRS-43265; TT-67-33889) CFSTI: \$3.00

An overview is presented on the development, construction, and operation of various reactors, the prospects for constructing economical fast breeders and the problems involved, and nuclear energy programs in various countries. Among the findings reported are the following: (1) A considerable number of power plants under construction are nuclear power plants which operate with some fundamental type of thermal reactors. (2) Energy production based on nuclear energy has become an important industrial branch. (3) Operating experience with sodium-cooled fast reactors, and tests with fuel elements of uranium and plutonium dioxides indicate the feasibility of building a fast reactor which can supply cheaper electric energy than other types. M.G.J

N68-18384# Atomic Energy Commission, Washington, D. C. Div. of Industrial Participation.

THE NUCLEAR INDUSTRY

1967 184 p Presented at the Atomic Indus. Forum's Ann. Conf., Chicago, 6 Nov. 1967

(TID-24102; CONF-671115-1) GPO: \$1.00

The peaceful application of nuclear energy that has the most impact on the U.S. economy is that of nuclear reactors to produce steam for generation of electric power. The volume of orders for nuclear-electric generating units for 1966 is compared with that for nine months of 1967. Other applications of nuclear energy are associated with desalting water, providing electric power for space and the ocean bottom, commercial explosives, preserving food, and producing new wood-plastic products. NSA

N68-21035*# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

[RESEARCH IN THE CONVERSION OF VARIOUS FORMS OF ENERGY BY UNCONVENTIONAL TECHNIQUES] Status Report

Manfred Altman Dec. 1967 105 p refs

(Grant NSG-316)

(NASA-CR-93979; INDEC-SR-13) CFSTI: HC \$3.00/MF \$0.65 SCL 10A

CONTENTS:

1. MATERIALS ENGINEERING M. Altman, S. Pollack, and L. Girifalco 9 p refs

2. PLASMA ENGINEERING S. Pollack, G. Schrenk, S. Schweitzer, and H. Yeh 5 p

3. ELECTROCHEMICAL ENGINEERING L. Nanis, J. O. M. Bockris, and P. Javet 9 p refs

APPENDIXES

4. THERMAL DIFFUSIVITY OF LIQUIDS Manfred Altman and K. Sreenivasan 14 p refs

5. SUPERCONDUCTIVITY IN EVAPORATED TUNGSTEN FILMS S. Basavaiah and S. R. Pollack 8 p refs

6. STUDIES OF THERMAL TRANSPIRATION FOR THE DEVELOPMENT OF A "THERMAL PUMP" Manfred Altman and E. Hopfinger 16 p refs

7. OVERPOTENTIAL TRANSIENTS ON THE ROTATING DISK L. Nanis and Irving Klein 3 p

8. CURRENT AND POTENTIAL DISTRIBUTION IN CYLINDRICAL GEOMETRIES: ENGINEERING APPLICATION TO FUEL CELL DESIGN L. Nanis and Wallace Kesselman 5 p refs

9. FOAMING ELECTROLYTE FUEL CELL L. Nanis and A. P. Saunders 4 p

10. ATOMIC SCALE ELECTRODE PROCESSES: EXCHANGE, CURRENT DENSITY ON IRIIDIUM P. Javet and L. Nanis 7 p refs

11. PRIMARY AND SECONDARY CELLS USING CHARGE TRANSFER COMPLEXES 7 p refs

N68-25106# Goodyear Atomic Corp., Piketon, Ohio.

ENVIRONMENTAL RADIATION LEVELS AND CONCENTRATIONS Second Half and Annual Summaries, 1967

B. Kalmon and S. H. Hulett 8 Feb. 1968 16 p

(Contract AT(33-2)-1)

(GAT-553) CFSTI: HC \$3.00/MF \$0.65

The average environmental radiation and concentration levels for the Goodyear Atomic Corporation gaseous diffusion plant, for the second half of 1967 and for the calendar year 1967, are summarized. The results for the first half of 1967 have been previously reported but are also included in tabular form. For the second half of 1967, the water beta-gamma and the background exposure increased over the first half values. The air alpha, air beta-gamma, and the water alpha remained essentially unchanged. For calendar year 1967 versus calendar year 1966, all values remained unchanged except for the water beta-gamma value which increased significantly. However, the 1967 value is only 0.24% of the AEC concentration standard. Penetrating background dose rates remained unchanged from the 1966 values. In the calculations all of the exposure rates were assumed attributable to plant operations. As in the past, however, the off-site and on-site patterns are very much alike in form and intensity with no significant difference between average values. Based on the on-site and off-site intensities, it is evident that the plant operations have not added appreciably to the general background penetrating radiation. Author

N68-28181# Los Alamos Scientific Lab., N. Mex.

ENERGY SOURCES OF THE FUTURE WITH EMPHASIS ON THE LIGHT ELEMENTS

James L. Tuck [1967] 7 p refs Presented at the 6th IEEE Region Conf., Portland, Ore.

(Contract W-7405-ENG-36)

(LA-DC-9519; CONF-680502-2) CFSTI: HC \$3.00/MF \$0.65

A discussion of available power sources and their efficient application is presented. A review of fossil fuel reserves and

hydroelectric and solar energy potentials is discussed. The description and aspects of nuclear fission and fusion energies are described.
Author (NSA)

N68-28227* Air Products and Chemicals, Inc., Allentown, Pa.
STUDY, COST, AND SYSTEM ANALYSIS OF LIQUID HYDROGEN PRODUCTION Final Report
N. C. Hallett Jun. 1968 323 p refs
(Contract NAS2-3894)
(NASA-CR-73226) CFSTI: HC\$3.00/MF\$0.65 CSCL 07A

This report contains information related to contemplated large-scale liquid hydrogen systems. Descriptions of feasible processes and equipment are presented. Information concerning availability and cost of required raw materials and energy are projected. Composite system analyses based on preliminary NASA hypersonic transport (HST) liquid hydrogen requirements indicate estimated average product cost of 7.7 to 8.8 cents per pound.
Author

N68-31690 North American Rockwell Corp., Los Angeles, Calif.
FRONTIERS OF TECHNOLOGY STUDY. VOLUME 3: IMPLEMENTATION
M. A. Sulkin, T. R. Parsons, and D. I. Sinizer 5 Jan. 1968 491 refs
(Contract H-779)
(PB-178272) CFSTI: HC\$3.00/MF\$0.65

The report describes methods used for screening technologies and selecting technological areas for implementation requirement studies; discusses current technology status, urban transportation application, advantages, disadvantages, problems associated with application, research and development requirements, gross costs, and other factors bearing on the transferability of the selected technological areas; and makes specific recommendations with regard to these areas.
Author (USGRDR)

N68-31703 North American Rockwell Corp., Los Angeles, Calif.
FRONTIERS OF TECHNOLOGY STUDY. VOLUME 2: SURVEY
M. A. Sulkin, T. R. Parsons, and D. I. Sinizer 5 Jan. 1968 266 p refs
(Contract H-779)
(PB-178271) CFSTI: HC\$3.00/MF\$0.65

The report documents the technology review portion of the program; describes the design of the literature review and field survey; briefly discusses the potentially transferable technologies identified; and lists sources of expertise for those technological areas.
Author (USGRDR)

N68-34388* Stanford Research Inst., Menlo Park, Calif.
SOME MAJOR IMPACTS OF THE NATIONAL SPACE PROGRAM. 4: IMPACTS OF NEW MATERIALS TECHNOLOGY
Arthur E. Bayce Jun. 1968 63 p refs
(Contract NASw-1722; SRI Proj. MU-7227)
(NASA-CR-96813) CFSTI: HC\$3.00/MF\$0.65 CSCL 05C

Contributions of NASA to selected areas of materials technology and the resulting impact on the national economy were investigated through a literature search technique. All entries in STAR (Scientific and Technical Aerospace Reports) dealing with 33 selected materials areas were obtained for the period between 1962 and 1967. Technology areas that had a significant percentage of NASA reports were studied, namely electroforming; fuel cells; nickel-cadmium, silver-cadmium, and silver-zinc batteries; refractory alloys; solar cells; and stress corrosion of titanium alloys. All eight areas were considered to have impact on the power generation; all but refractory and titanium alloy research on communications; and all but silver-cadmium battery and solar cell research on

transportation. Electroforming, nickel-cadmium batteries, and titanium alloys were found to have impact on health care. It was concluded that the battery, refractory alloy, and titanium alloy development had major impact; fuel cell research moderate impact; and electroforming and solar cell NASA-sponsored work had light impact on the national economy
M.W.R.

N68-36752 National Lending Library for Science and Technology, Boston Spa (England).
THE FUTURE DEVELOPMENT OF ENERGETICS

L. Melent'ev [1968] 7 p Transl. into ENGLISH from Pravda (Moscow), 12 Jul. 1968
(M-7428) Available from Natl. Lending Library, Boston Spa, Engl.

As only an estimated 25% of the potential energy contained in various forms of fuel is actually used, the scientific and technical problems connected with developing and improving the efficiency of energetics are examined. The immediate concern is seen as strengthening the base of electrification primarily by improving existing methods of producing, transmitting, and exploiting electric power. It is estimated that by the 1980's the annual increase in electric capacity in the U.S.S.R. should approximate 30 to 35 million kw. Various channels which should be explored in producing electric power are assessed, with the prediction made that a leading role will be played by the use of nuclear fuel for producing electric and possibly thermal energy; the idea of combining atomic power stations and magnetic hydrodynamic generators is mentioned. Consideration is also given to the longer-term problems which are identified as the need to seek out new sources of energy; new methods of transforming thermal, nuclear, and chemical energy into electric power; and new ways of transmitting electricity over long distances.
M.G.J.

N68-38243 Navy Dept., Washington, D. C. Translation Div.
THE ATOMIC INDUSTRY [ATOMNAYA PROMYSHLEN-NOST]
P. T. Astashenkov 22 Jul. 1968 227 p refs Transl. into ENGLISH from At. Prom. (Moscow), 1956 237 p
(NIC-TRANS-2653; AD-674339) CFSTI: HC\$3.00/MF\$0.65

In the USSR a leading atomic industry has been created and is developing successfully. This branch of production also exists in other countries of the world. In this book an attempt has been made using the materials which have been published in the Soviet and foreign press and on the basis of the achievements of Soviet and foreign technology to give an account in popular form of the most important aspects of the production picture of a modern atomic industry.
Author (TAB)

N68-38380 Environmental Science Services Administration, Idaho Falls, Idaho. Air Resources Field Research Office.
RELATIVE DOSE FACTORS FROM LONG-PERIOD POINT SOURCE EMISSIONS OF ATMOSPHERIC POLLUTANTS
George E. Start and Earl H. Markee, Jr. In Atomic Energy of Can., Ltd. USAEC Meteorol. Inform. Meeting 1967 p 59-76
Prepared for AEC

A new technique for estimating air pollution exposures which result from long-period effluent releases is described. A continuous point source release is approximated by sequential instantaneous point source releases. The total effluent exposure effect of the release is determined from the summed total integrated concentrations from each instantaneous point release. These exposures are expressed as a relative dose factor, the sum of hourly values of total integrated concentration (units-hr/m³). The new method is particularly useful for calculating relative dose factors in regions in which the winds undergo a marked diurnal cycling. The maximum mixing depth concept is adopted to limit vertical dispersion. As a computational simplification, the fields of atmospheric stability and wind within the boundary layer are assumed

01 ENERGY SYSTEMS

to have spatial homogeneity during each hourly computational interval. The technique is illustrated for a continuous, ground-level, point source release of effluent. Author (NSA)

N68-38392# Environmental Science Services Administration, Silver Spring, Md.

DIFFUSION MEASUREMENTS AT MEDIUM RANGE FROM A CONTINUOUS POINT SOURCE

Kendall R. Peterson *In* Atomic Energy of Can., Ltd. USAEC Meteorol. Inform Meeting 1967 p 252-261 Supported by AEC

The structure of the Brookhaven plume on a day with neutral stability was delineated out to distances of about 150 miles downwind from the Brookhaven reactor. A vertical cross-section at 144 n miles from the source showed the plume to be well organized with good vertical mixing giving nearly uniform maximum concentrations to at least 2000 feet. The usefulness of a vertical saw-tooth flight path was verified and is believed to be superior to a number of horizontal passes perpendicular to the plume. Peak concentrations, as observed, decrease by more than two orders of magnitude at a distance of 150 n miles and a travel time of 10 to 12 hours. Peak concentrations corrected for decay appear to decrease by about a factor of 7 to 10 over the same distance and time. The lateral standard deviation of the plume seems to fit an extension of the Pasquill-Gifford "D" curve with distance and is approximately equal in kilometers to 1.2t with time in hours.

Author (NSA)

N69-12576*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

NUCLEAR REACTOR HEAT SOURCES FOR FUTURE POWER GENERATION

Samuel J. Kaufman, Donald Bogart, John V. Miller, and Richard E. Gluyas *In its* Selected Technol. for the Elec. Power Ind. 1968 p 1-34 refs

Avail: CFSTI CSCL 18L

The characteristics of the fast-breeder reactor, which seems to offer the greatest potential for the power industry, are reviewed. Experiences with reactors for space propulsion or space power systems, designed to operate at much higher temperatures and for shorter times than those of commercial power systems, are compared with information gathered from the power industry, the AEC, and their contractors. Three areas of fast-breeder reactors are discussed: (1) the difference between breeder reactors and the power reactors now in use; (2) some potential materials problems associated with breeder reactors, with emphasis on fuel elements; and (3) the relative merits of gas and liquid metal coolants for reactors.

K.W.

N69-12586*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

SUMMARY OF CONFERENCE

Bernard Lubarsky *In its* Selected Technol. for the Elec. Power Ind. 1968 p 305-307

Avail: CFSTI CSCL 10B

Selected processes and equipment developed for aerospace technology are surveyed for their relevance to the electric power industry. The lower fuel cost associated with breeder reactors is considered because it will modify the balance of emphasis between efficiency, first cost, and reliability to which the power industry is currently accustomed. Smaller boilers discussed in connection with the Rankine system are feasible for use with pressurized-water or liquid-metal cooled reactors. The potential of the gas turbine in power generation is pointed out, and the advantages of a closed-cycle gas turbine coupled with a gas-cooled breeder reactor are compared with three-loop systems. Some of the control and reliability

engineering techniques are considered, including automated checkout, startup, and operation. Advanced technologies of materials, bearings, seals, and instruments such as temperature sensors and torque meters, are examined for potential industrial application. Attention is also given to cryogenic electrical components, superconductivity, and direct energy conversion by electrochemical, thermoelectric, thermionic, and magnetohydrodynamic processes.

K.W.

N69-13314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INTERNATIONAL SYMPOSIUM ON PRODUCTION OF ELECTRIC POWER BY MEANS OF MHD GENERATORS (SELECTED ARTICLES)

14 Nov. 1968 551 p refs Transl of the book "Mezhdunarodnyy Simpozium Po Proizvodstvu Elektroenergii S Pomoshch'yu MGD Generatorov" 1968 p 1-481 Meeting Held at Salzburg, Austria, 4-8 Jul. 1966 Sponsored by Inter. Atomic Energy Agency and EURATOM

(AD-674611; FTD-HT-67-195) Avail: CFSTI CSCL 10/2

A compilation of articles on the research, development, and operation of magnetohydrodynamic generators used for electrical energy production are presented. Related papers on such topics as superconducting magnet systems and the chemistry of various metal compounds are included. For individual titles see N69-13315-N69-13354.

N69-15807# Argonne National Lab., Ill.

CHEMICAL ENGINEERING DIVISION Semiannual Report, Jul.-Dec. 1967

May 1968 197 p refs (Contract W-31-109-eng-38)

(ANL-7425) Avail: CFSTI

Developments in research programs are presented. Included are: (1) a description of the CHEMLOC-2 computer program for calculating extent of metal-water reaction, core heating, and core motion; (2) laboratory investigations on fluorination of UO_2 - PuO_2 fission products; (3) current status of investigation of neutron capture cross sections of reactor materials; (4) determination of burnup of fast reactor fuels by photometric titration; (5) compact pyrochemical processes; (6) energy conversion systems; and (7) chemical studies of irradiated ceramic fuels.

F.O.S.

N69-17184 Environmental Science Services Administration, Silver Spring, Md. Air Resources Labs.

METEOROLOGY AND ATOMIC ENERGY, 1968

David H. Slade, ed. Oak Ridge, Tenn. AEC Jul. 1968 450 p refs Supported by AEC

(TID-24190) Avail: CFSTI

Studies of factors affecting radioactive atmospheric pollution are presented, and the relationship between meteorology and the nuclear industry is defined. Emphasis is placed on investigating the effects of atmospheric motions on suspended pollutants, the knowledge of which may be used in solving problems of health, safety, and economics arising from the peaceful exploitation of nuclear fission or fusion process. The role of a new field of meteorology, known as air pollution meteorology, which evolved with the development of the atomic energy industry, is discussed. Meteorological fundamentals relating to atmospheric transport and diffusion mechanisms within the lower layers of the atmosphere, an outline of theories, and a discussion of experiments on this subject are included. Atmospheric processes other than natural turbulence which affect effluent concentrations are investigated, and meteorological instruments for studying these effects, and other related phenomena, are discussed. Final topics include the concepts and techniques of radioactive cloud dose calculation and methods of environmental safety analysis.

A.C.R.

N69-19492# Sandia Corp., Albuquerque, N. Mex. Aerospace Nuclear Study Dept.

THE AERIAL DETECTION OF Co-60 FUELED RADIOISOTOPE THERMOELECTRIC GENERATORS

R. J. Everett Sep. 1968 17 p refs

(Contract AT(29-1)-789)

(SC-TM-68-627) Avail: CFSTI

The aerial detection of a hypothetical ^{60}Co radioisotope thermoelectric generator is discussed for the ground level and earth and water penetration cases. A knowledge of ^{60}Co radiation fields and minimum detection levels of gamma counting equipment allowed an estimation of the detection altitude as a function of source size. Similar plots were constructed for the earth and water penetration case, using reported values for absorption and radiation buildup. Actual detection of ^{60}Co sources in the past allowed a comparison with theoretical predictions. Author (NSA)

(NASA-TM-X-1871) Avail: CFSTI CSCL 21F

The use of nuclear powerplants based on nuclear aircraft technology to power ocean-going air-cushion vehicles has been investigated. Because aircraft nuclear powerplants might be an order of magnitude lighter than current nuclear marine plants, the performance of nuclear air-cushion vehicles is dramatically altered. Instead of vehicles limited to short ranges and speeds of about 80 knots, they become vehicles with virtually unlimited range and speeds in the range of 100 to 200 knots. The study considers vehicles with gross weights of 1000 to 10,000 tons and clearance heights from 10 to 40 feet, which are sufficient to clear ocean waves 80 to over 90 percent of the time. The cargo capacity ranges from 20 to 50 percent of the gross weight. Direct operating costs are 2 to 5 cents per ton-mile and are independent of the distance travelled. Author

N69-26227# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A METHOD FOR DETERMINING THE ECONOMIC EFFECTIVENESS OF GAS TURBINE UNIT SYSTEMS WITH THE CONSIDERATION OF OPTIMUM PARAMETERS

F. T. Markovskii and A. F. Usik 6 Sep. 1969 14 p refs Transl. into ENGLISH from Energomashinost. (Moscow), no. 3, 1966 p 61-67

(AD-683130; FTD-HT-23-343-68) Avail: CFSTI CSCL 21/5

A method for determining the economic effectiveness of nonregenerative gas turbine units (GTU) was developed (with consideration of the thermodynamic and engineering-economic characteristics). This method was formulated for gas turbine units which operate at rated power (for generating electricity). The costs are expressed as functions of thermodynamic parameters and economic operating conditions. The optimum combination of thermodynamic properties is determined first. Various considerations involved in designing units using expensive fuel for long periods are discussed for the case when maximum operating efficiency is the main concern. For peak units running on cheap fuel, the importance of other factors increases. When the parameters are interdependent, the problem is solved by the method of Lagrange factors; when the parameters are independent, a system of partial differential equations must be solved. Balance equations for gas turbine unit shaft operations and for compression ratios are used to reduce the interdependency of parameters and to utilize the latter method. Compression ratios affecting the investment and operating costs are studied in detail. The calculated costs are found to agree well with actual costs. A final expression is obtained for annual costs in terms of the gas turbine unit parameters. Author (TAB)

N69-39189# Wayne State Univ., Detroit, Michigan. Center for Application of Sciences and Technology.

APPLYING NASA TECHNOLOGY TO AIR POLLUTION: THE SULFUR DIOXIDE PROBLEM, SECTION 2 Final Report

[1969] 27 p refs Revised Supersedes X69-14671

(Contract NSR-23-006-044)

(NASA-CR-100629) Avail: CFSTI CSCL 13B

After a broad review of the characteristics of the air pollution problem, the reduction of sulfur oxides from fuel oils, flue gases, and coal is discussed. The use of fuel cells and solid state devices in commercial electric power generation is considered. Technical and legislative solutions to the sulfur dioxide problem are explored along two lines: (1) the Kaldor Criterion, or net benefit to the system, with gains of one group offsetting losses of another group; and (2) the Pareto Optimality, i.e., no sacrifices on the part of anyone. As an example of (1), the liquefaction of coal for electric power generation is discussed; as an example of (2), the use of nuclear power plants for high-voltage dc power generation is mentioned. K.W.

N70-14504# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Div.

ABUNDANT NUCLEAR ENERGY

May 1969 347 p refs Presented at the Proc. of a Symp., Gatlinburg, Tenn., 26-29 Aug. 1968

Avail: CFSTI

CONTENTS:

1. RATIONALE FOR LOW-COST NUCLEAR HEAT AND ELECTRICITY J. A. Lane (Oak Ridge Natl. Lab., Tenn.) p 3-28 refs

2. ENERGY INTENSIVE AND HEAT INTENSIVE PROCESSES FOR A NUCLEAR ENERGY CENTER J. M. Holmes (Oak Ridge Natl. Lab., Tenn.) p 29-43 refs

3. PHOSPHORUS M. M. Striplin Jr. (Tenn. Valley Authority) p 47-66 refs

4. EFFECT OF LOW-COST NUCLEAR ENERGY ON THE CHLORINE-CAUSTIC INDUSTRY J. E. Currey (Hooker Chem. Corp.) p 67-81 refs

5. ACETYLENE AND LOW-COST POWER W. E. Lobo (Consulting Chem. Eng.) p 83-92 refs

6. THE FIXATION OF NITROGEN IN ARC PROCESSES R. S. Timmins (Abcor, Inc.) p 93-105

7. THE ECONOMICS OF HYDROGEN AND OXYGEN PRODUCTION BY WATER ELECTROLYSIS AND COMPETITIVE PROCESSES J. E. Mrochek (Oak Ridge Natl. Lab., Tenn.) p 107-122 refs

8. PRODUCTION OF AMMONIA USING LOW-COST NUCLEAR ENERGY G. M. Blouin (Tenn. Valley Authority) p 123-134 refs

9. ALUMINUM J. R. Chapman (Aluminum Co. of Am.) p 137-161 refs

N69-36574# Royal Inst. of Tech., Stockholm (Sweden). Div. of Plasma Physics.

THE FUTURE ENERGY SUPPLY OF THE WORLD

B. Lehnert Apr. 1969 7 p refs

(Rept-69-11) Avail: CFSTI

The available data and energy consumption predictions indicate that conventional energy supplies will become insufficient during the first half of the next century and this crisis can only be avoided by the use of nuclear sources. The transition to nuclear power is discussed and it is shown that research and development of breeder and/or fusion reactors should be intensified. ESRO

N69-36723# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE POTENTIAL OF NUCLEAR POWER FOR HIGH-SPEED OCEAN-GOING AIR-CUSHION VEHICLES

Frank E. Rom and Albert F. Kascak Washington Sep. 1969 34 p refs

01 ENERGY SYSTEMS

10. MAGNESIUM S. Fougner (Magnalith Corp.) p 163-180 refs

11. IRON AND STEEL WITH HYDROGEN A. M. Squires (Civ. Coll. of the City of New York) p 181-196 refs

12. ELECTROWINNING OF METALS J. B. Rosenbaum (Bureau of Mines, Salt Lake City, Utah) p 197-201 refs

13. A BLEACHED STRAW PULP MILL FOR AN AGRO-INDUSTRIAL COMPLEX J. N. Mc Govern (Parsons and Whitmore, Inc.) p 205-218 refs

14. SPACE HEATING IN URBAN ENVIRONMENTS A. J. Miller (Oak Ridge Natl. Lab., Tenn.) p 219-237 refs

15. APPLICATION OF LOW-COST ENERGY TO PROCESSING OF SEWAGE WATER FOR REUSE I. Spiewak (Oak Ridge Natl. Lab., Tenn.) p 239-247 refs

16. MARINE CHEMICAL RECOVERY W. C. Yee (Oak Ridge Natl. Lab., Tenn.) p 249-268 refs

17. POTABLE WATER FROM SEAWATER BY HIGH-TEMPERATURE ELECTRODIALYSIS W. A. Mc Rae (Ionics, Inc.) p 269-298 refs

18. NUCLEAR DESALTING C. C. Burwell (Oak Ridge Natl. Lab., Tenn.) p 299-312 refs

N70-14505# Oak Ridge National Lab., Tenn.

RATIONALE FOR LOW COST NUCLEAR HEAT AND ELECTRICITY

James A. Lane *In* AEC Abundant Nucl. Energy May 1969 p 3-28 refs

Avail: CFSTI

It is projected that the average delivered cost of electricity in the United States will decrease to 3.5 mills/kw-hr and the per capita consumption will increase to 30,000 kw-hr per annum in 2000 AD. Achieving such low-cost power will require significant improvements in generating costs, as well as reductions in transmission and distribution costs. Details of how this might be done are described. Generating costs, for example, will be reduced to about 1.5 mills/kw-hr through the development of very large (i.e., 5000-Mw(e)) high-performance breeders served by large-scale fabrication and processing plants. If the sale price of electricity is properly assigned to various types of customers as a function to the amount used by each customer, an average delivered price of 3.5 mills/kw-hr would result in a rate of 5.5 mills/kw-hr for residences and 1.5 mills/kw-hr for industries. Author (NSA)

N70-14506# Oak Ridge National Lab., Tenn.

ENERGY INTENSIVE AND HEAT INTENSIVE PROCESSES FOR A NUCLEAR ENERGY CENTER

John M. Holmes *In* AEC Abundant Nucl. Energy May 1969 p 29-43 refs

Avail: CFSTI

Chemical and metallurgical industries are large energy consumers with increasing power demands and significant sensitivities to changes in electricity prices. The major categories considered for installation at nuclear energy centers include: balanced fertilizers; metals, such as aluminum, iron, steel, and magnesium; plastics; and brine chemicals. Other energy-intensive systems that may show promise include waste-water treatment, electric railways, high-temperature process heating, urban space heating, and several recently developed electroorganic processes. For economic utilization of the power from a 1000-Mw(e) nuclear reactor, a number of the proposed systems would have to be combined into a complex. Author (NSA)

N70-14519# Oak Ridge National Lab., Tenn.

APPLICATION OF LOW-COST ENERGY TO PROCESSING OF SEWAGE WATER FOR REUSE

Irving Spiewak *In* AEC Abundant Nucl. Energy May 1969 p 239-247 refs

Avail: CFSTI

Water supply and sewerage systems for a city of 2 million are analyzed. Examples are given of a conventional system, a system using advanced waste treatment, and a system using complete waste-water recycle. Low-cost energy has a significant impact only on the water recycle systems, which includes a unique desalting process combining electrodialysis and distillation. Waste solids are distilled to dryness. The cost of the total water system ranges from \$0.33/1000 gal for the conventional system to \$0.45/1000 gal for the water recycle system.

Author (NSA)

N70-21669# Edison Water Quality Lab., N.J.

BIOLOGICAL EFFECTS OF OIL POLLUTION: BIBLIOGRAPHY. A COLLECTION OF REFERENCES CONCERNING THE EFFECTS OF OIL ON BIOLOGICAL SYSTEMS

Donna R. Radcliffe and Thomas A. Murphy Oct. 1969 52 p refs

(Contract DAST-19W70-02038)

(PB-188206) Avail: CFSTI CSCL06F

References on the biological effects of oil are listed according to the following categories: Publications on the general aspects of oil pollution, reports of oil spill incidents, general biological effects of oil and of specific oil spill incidents, effects of oil on birds, effects of oil on fish, effects of oil on shellfish, effects of oil on freshwater invertebrates, effects of oil on plants, effects of oil on dissolved oxygen, carcinogenic effects of oil, and miscellaneous biological reports on oil.

Author (USGRDR)

N70-25747# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 1: INTRODUCTION, CHAPTERS 1 AND 2

Nov. 1969 289 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188714) Avail: CFSTI CSCL05C

Contents: Introduction: Legal aspects (International considerations, Allocation of federal jurisdiction over activities on or affecting the outer continental shelf, Background of the Submerged Lands Act and Outer Continental Shelf Lands Act, Administration of the Outer Continental Shelf Lands Act); Resource aspects (Known and potential resources of the outer continental shelf, Living resources of the continental shelf, Anticipated development of offshore mineral industry and technology, Economic analysis of leasing experience under the Outer Continental Shelf Lands Act, An economic analysis of prorationing of production) USGRDR

N70-25748# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 2: CHAPTERS 3 THROUGH 7

Nov. 1969 336 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188715) Avail: CFSTI CSCL05C

Contents: Background of the submerge lands act and outer continental shelf lands act; Administration of the outer continental shelf lands act; Living resources of the continental shelf; Anticipated development of offshore mineral industry and technology.

Author (USGRDR)

N70-25749# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 3: CHAPTERS 8 THROUGH 12

Nov. 1969 249 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188716) Avail: CFSTI CSCL05C

Contents: Economic analysis of leasing experience under the Outer Continental Shelf Lands Act; An economic analysis of prorationing of production; User interaction and environmental impact; Analysis of the existing system of administration of outer continental shelf lands; Analysis of alternatives to existing system.

USGRDR

N70-25750# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 4: APPENDICES

Nov. 1969 397 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188717) Avail: CFSTI CSCL05C

Contents: Truman proclamation; Convention on the continental shelf; Convention on the territorial sea and the contiguous zone; Convention on the high seas; Convention on fishing and conservation of the living resources of the high seas; Public Law 89-658; 80 Stat. 908 fishery zones - extra-territorial sea; Marine Resources and Engineering Development Act of 1966; A discussion of the legislative history and possible construction of the Convention on the Continental Shelf; U.N. resolution establishing the Ad Hoc Committee to study peaceful uses of the sea-bed and the ocean floor beyond the limits of national jurisdiction; Proposal of the permanent Mission of Malta; Draft resolution of United States to Ad Hoc Committee; Submerged Lands Act; Outer Continental Shelf Lands Act; Regulations - Bureau of Land Management; Regulations - U.S. Geological Survey; Exchange of correspondence between the Department of the Interior and the Department of the Army regarding review of applications for permits; Potential Mineral Resources of the United States Outer Continental Shelf; Report of the Secretary General to the United Nations Economic and Social Council on the Resources of the Sea.

USGRDR

N70-25751# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 5: APPENDICES

Nov. 1969 399 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188718) Avail: CFSTI CSCL05C

Contents: Bibliography and source list; Questionnaire to industries: Notices concerning oil and gas leasing; Summaries of salt water angling and collisions involving offshore structures; Work statement; Comparative laws and policies (domestic).

USGRDR

N70-25752# Nossaman, Waters, Scott, Krueger, and Riordan, Los Angeles, Calif.

STUDY OF OUTER CONTINENTAL SHELF LANDS OF THE UNITED STATES. VOLUME 6: APPENDICES

Nov. 1969 220 p refs Sponsored by the Public Land Law Rev. Comm. Revised

(PB-188719) Avail: CFSTI CSCL05C

Contents: Offshore mineral leasing experiences of coastal states; Comparative laws and policies (foreign); Compilation of alternatives; Department of the Interior reports.

USGRDR

N70-34670# National Air Pollution Control Administration, Washington, D.C.

CONTROL TECHNIQUES FOR SULFUR OXIDE AIR POLLUTANTS

Jan. 1969 144 p refs

(PB-190254; AP-52) Avail: SOD \$1.25; CFSTI CSCL 13B

The document reports the major sources of sulfur oxide air pollution, and discusses the control techniques for fuel combustion processes, industrial processes, and dispersion from stacks as found in many industries.

USGRDR

N70-36154# Congress. House. Committee on Interstate and Foreign Commerce.

AIR POLLUTION CONTROL RESEARCH INTO FUELS AND MOTOR VEHICLES

Washington GPO 1969 127 p refs Hearing on H.R. 12085 before Comm. on Interstate and Foreign Com., 91st Congr., 1st Sess., 19 Jun. 1970 Its Serial 91-17

Avail: Subcomm. on Public Health and Welfare

Statements and reports on air pollution control program activities, current and projected research, and environmental problems are presented. Abatement activities and data pertaining to motor vehicle, aircraft engine, and diesel engine exhausts, and industrial wastes are discussed. Air pollution abatement by federal facilities is also covered.

N.E.N.

N70-37081# Atomic Energy Commission, Washington, D.C. Div. of Research.

THE FUSION TORCH: A NEW APPROACH TO POLLUTION AND ENERGY USAGE

Bernard J. Eastlund and William C. Gough 7 Nov. 1969 27 p refs Presented at 62d Ann. Meeting on Waste Treatment Appl. of Radiation Chem., Washington, D.C., 16-20 Nov. 1969

(Conf-691108-2) Avail: CFSTI

A new concept is described for the handling of large volumes of solid wastes in the future. The energy and material balance for processing U. S. municipal wastes in the year 2000 via this concept is compared with that for advanced incineration. Background discussion of the properties of a fusion plasma and a future fusion power system are given.

Author (NSA)

N70-37097# Oak Ridge National Lab., Tenn.

PRELIMINARY APPRAISAL OF THE HAZARDS PROBLEMS OF A D-T FUSION REACTOR POWER PLANT

A. P. Fraas and H. Postma May 1970 32 p refs

(Contract W-7405-eng-26)

(ORNL-TM-2822) Avail: CFSTI

A preliminary assessment of the hazards problems of a D-T fusion reactor was made to provide some notion of the seriousness of these problems in possible future applications of thermonuclear power plants. The inherent characteristics of magnetically confined plasmas appear to be such that any tendency toward general power overshoots or local hot spots will be more than compensated by other factors, so that there should be no difficulties with either general or local temperature or power excursions that might cause a meltdown or an explosion. In turning to radiological hazards, the principal source of concern is tritium. Fortunately, fusion reactor systems will ordinarily be designed so that the bulk of the tritium produced will be consumed as fuel. Thus, though the tritium production rate will run roughly 1000 times that in a fission reactor, by proper plant design the tritium inventory can be kept to about the same level as in a conventional fission reactor such as a PWR.

Author (NSA)

N70-37343# Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

A REVIEW AND COMPARISON OF SELECTED UNITED STATES ENERGY FORECASTS

Dec. 1969 96 p Prepared for the Executive Office of the President, Office of Sci. and Technol.

(PB-189938) Avail: \$1.00; CFSTI CSCL 05A

The report collects in a single volume the essence of nineteen energy forecasts published in recent years by private organizations, government agencies, and individuals and compares their forecast values, assumptions, and methodologies. The study evaluates existing energy forecasts for policy planning purposes. The forecasts were prepared for different purposes and often reflect differences in terminology, coverage, and assumptions. The comparative tables in the report take these differences into account insofar as possible.

USGRDR

01 ENERGY SYSTEMS

N70-37672# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE ENERGY SOURCES OF AVIATION ENGINES

Pin-Chuan Chang 15 May 1970 8 p Transl. into ENGLISH from Hang K'ung Chih Shih (Communist China), no. 7, 1960 p 16 (AD-707178; FTD-HT-23-213-70) Avail: CFSTI CSCL 21/4

After reviewing the properties and limitations of chemical fuels such as gasoline, solid fuel and hydrogen fuel, the report discusses the possibilities of ionic fuel and nuclear fuel, and their existing problems of application to aviation. It is stressed that due to the fast scientific progress and requirements, these pending problems may soon be solved. Author (TAB)

N70-39315# California Univ., Berkeley.

THE FUTURE OF VEHICULAR POWER PLANTS

Ernest S. Starkman In Ariz. Univ. Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 12-52 refs

Avail: NTIS

The automobile is discussed with relation to its comparative role in air pollution, including the pollutants contributed and their effects. Revisions in engine operation to reduce air pollution are mentioned, and it is noted that as the levels of carbon monoxides and unburned hydrocarbons were being lowered, nitrogen oxide levels increased. Federal and state controls are described, and future air quality is predicted. The slow rate at which pollution control can be realized through the modification of new vehicles alone is suggested. Powerplants possible for automobiles other than internal combustion engines are described, including the electric vehicle and associated problems, steam engines, gas turbines, Wankel and Stirling engines, and engines using natural gas as fuel. Accomplishments in pollution reduction due to conventional engine controls are discussed, and past and future relative pollutant production from automobiles is compared with that from stationary sources. Graphs illustrate the presentation, and a bibliography is included. P A B.

N70-41770# Congress. Senate. Committee on Public Works.

AIR POLLUTION: 1970, PART 3

Washington GPO 1970 294 p refs Joint hearings on S. 3229, S. 3466, and S. 3546 before Comm. on Public Works and Comm. on Com., 91st Congr., 2d Sess., 24-25 Mar. 1970 Prepared by Subcomm. on Air and Water Pollution of the Comm. on Public Works and the Comm. on Com.

Avail: SOD \$1.25

Noise pollution, its effects on man and animals, and possible abatement legislation are discussed. Other topics include wheat for motor fuel, airline antipollution measures, automobile exhaust emission and the position of the auto industry, the effect of gasoline composition and associated research and development, and toxicological problems associated with lead. P.A.B.

N70-41771# Congress. Senate. Committee on Public Works.

AIR POLLUTION: 1970, PART 4 From the Subcommittee on Air and Water Pollution

Washington GPO 1970 300 p refs Hearings on S. 3229, S. 3466, and S. 3546 before Comm. on Public Works, 91st Congr., 2d Sess., 26 Mar., 17 Apr., and 27 May 1970; also in Los Angeles, 1 Apr. Avail: SOD \$1.50

Information on California air basins, standards for exhaust emissions, and ambient air quality standards is presented. National air quality standards are then discussed, including automobile emission reduction, industrial processes, metropolitan areas, and the proposed amendments to the Clean Air Act. Data are presented on the ability of gas additives to clean engines and reduce exhaust emissions, and on specific research concerning the effects of the Chevron F-310 gas additive package. Methods to prevent and control air pollution build-up are described, and the guidelines for air pollution planning grants are presented. P.A.B.

N71-13756# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Angewandte Reaktorphysik.

AN APPROACH TO COMPARE AIR POLLUTION OF FOSSIL AND NUCLEAR POWER PLANTS

P. Jansen, S. Jordan, and W. Schikarski 1969 18 p refs Presented at Symp. on Environ. Aspects of Nucl. Power Sta., New York, 10-14 Aug. 1970

(Conf-700810-20; SM-146/57) Avail: AEC Depository Libraries

The possible air pollution of fossil and nuclear power plants is discussed. Since the emissions of fossil and nuclear power plants are different in nature and effect on the environment, the comparison of the air pollution of power plants is difficult. This is mainly due to the fact that fossil power plants pollute air by the emission of reactive gases (i.e., sulphur oxides) and smoke (aerosols) whereas nuclear power plants could emit radioactive gases (i.e., fission gases) and radioactive aerosols which affect the environment in a different way. A study has been carried out to compare air pollution of both nuclear and fossil fuelled power plants. Two models have been used in the study. The first was developed on the basis of the maximum permissible concentrations set by biophysical and medical bodies for the various pollutants. The second model used the fact that excessive burdens by the various pollutants to the surrounding population lead statistically to a certain number of cases of illness or death. Author (NSA)

N71-23353# Office of Naval Research, London (England).

SEVENTH INTERNATIONAL POWER SOURCES SYMPOSIUM, BRIGHTON, SUSSEX, 15-17 SEPTEMBER 1970

Alfredo Banos, Jr. 20 Jan. 1971 11 p refs Held at Brighton Sussex England, 15-17 Sep. 1970

(AD-718833; ONRL-C-1-71) Avail: NTIS CSCL 10/2

The report gives an analysis of the nations represented, and a full account of the papers according to: (a) nature of the paper, whether research, development, production and testing, or applications; (b) the type of contributing institution, and (c) the subject matter itself, and concludes with general remarks on the highlights of meeting. The appendix contains a complete list of the papers presented. Author (GRA)

N71-26623# Joint Publications Research Service, Washington, D.C.

GLOBAL CONTAMINATION OF THE ATMOSPHERE BY KRYPTON-85 FROM WORLD WIDE NUCLEAR POWER PLANTS AND THE RADIATION DANGER

I.L. Karol et al 20 May 1971 17 p refs Transl. into ENGLISH of the publ. 'Globalnoye Zagryazneniye Atmosfery Kryptonom-85 ot Miroyoy Yadernoy Energetiki-i Yego Radiatsionnaya Opasnost' Obninsk, Inst. of Exptl. Meteorology p 1-25 (JPRS-53174) Avail: NTIS

The annual mean and zonally averaged concentration of krypton-85 in the troposphere and lower stratosphere of the Northern and Southern hemispheres are calculated. The calculations are based on a numerical deviation of a global spread of the admixture in a meridional plane of the atmosphere. The results of the calculations with various combinations of the transfer parameters or the model are compared with the results of measurements in the U.S. and abroad. Predicted distributions of the expected levels of the gas were obtained up to the year 2,000. The corresponding radiation dose strengths in the air for the whole body and for individual organs of the human body were also calculated. These dose strengths and concentrations are compared with the maximum allowable levels which were established on the basis of the current recommendations of the International Commission for Radiological Defense and Medical Rules. Author

N71-28471# Committee on Public Works (U.S. Senate).

SOME ENVIRONMENTAL IMPLICATIONS OF NATIONAL FUELS POLICIES

Washington GPO 1970 74 p refs Presented by Comm. on Public Works, 91st Congr., 2d Sess., Dec. 1970
 Avail: SOD \$0.30

An objective analysis of the factors relevant to the development of fuels and energy policies compatible with environmental quality requirements is presented as a staff report to the Chairman of the Committee on Interior and Insular Affairs. Based on the expected population growth, the energy and fuel requirements are projected to the year 2000. Techniques and processes for pollution control are discussed, and the expenditures for pollution research are summarized for FY 1969, 1970, and 1971. F.O.S.

N71-29607* General Electric Co., Philadelphia, Pa.

H2 FUEL SYSTEM INVESTIGATION

W. Collier In NASA. Marshall Space Flight Center Proc.: Space Transportation System Propulsion Technol. Conf., Vol. 3 28 Apr. 1971 p 1191 1224

Avail: NTIS CSCL 211

Progress in designing and developing an air breathing engine system for space shuttle application is reported. Tasks included a parametric evaluation of various engine cycles employing hydrogen fuel; an engine design study; engine development plan and cost estimate; and performance specification. All work is completed, and a derivative of the F-101 engine was recommended and used as the referenced engine. While the hydrogen versus jet propulsion fuel evaluation is not yet complete, it appears that the use of hydrogen requires additional development in the fuel handling system and related control and accessory areas. No basic technological barriers were identified, however, for fitting an engine of this type to the desired application. A.C.R.

N71-31900* Battelle Memorial Inst., Columbus, Ohio.

THE FEDERAL R AND D PLAN FOR AIR POLLUTION CONTROL BY COMBUSTION-PROCESS MODIFICATION Final Report

11 Jan. 1971 352 p refs

(Contract CPA-22-69-147)

(PB-198066; APTD-0643) Avail: NTIS HC \$8.00/MF \$0.95 CSCL 13B

Results are reported of a study conducted for the Air Pollution Control Office to (1) identify gaps in combustion technology and (2) recommend a 5-year plan with priorities for effectively allocating resources for APCO supported combustion R and D directed toward meeting projected needs for air pollution control of energy conversion system by combustion modification. Combustion applications considered as elements of the plan include: central station power generation; industrial processing; industrial steam generation, commercial and residential heating; gas turbines and external combustion engines; and reciprocating internal combustion engines. A 5-year plan of combustion R and D is presented, with R and D opportunities identified and ranked in five priority levels. GRA

N71-32624* Coast Guard, Washington, D.C.

OIL POLLUTION LIABILITY AND FINANCIAL RESPONSIBILITY. A REPORT TO THE PRESIDENT AND THE CONGRESS Final Report

Dec. 1970 25 p

(PB-198775; USCG-OIL-70-1) Avail: NTIS

The report summarized a study on the need for measures to provide financial responsibility and limitation of liability for vessels, onshore and offshore facilities for costs of removing discharged oil and payment of damages resulting from the discharge. The report recommends to the President and the Congress no change in liability for vessels, federal preemption for vessels in interstate commerce, and that varying schedules of proof of financial responsibility of onshore and offshore facilities be established based on the pollution potential of the facility. GRA

N71-32625* George Washington Univ., Washington, D.C.

LEGAL, ECONOMIC, AND TECHNICAL ASPECTS OF LIABILITY AND FINANCIAL RESPONSIBILITY AS RELATED TO OIL POLLUTION Final Report

Dec. 1970 347 p refs

(Contract DOT-CG-10255-A)

(PB-198775; USCG-OIL-70-2) Avail: NTIS HC \$6.00/MF \$0.95 CSCL 13B

An intensive study of the oil pollution problem in its legal, economic and technical aspects is presented. The contents include the following: Analysis of the water quality improvement act; Theories of liability and their relation to oil pollution; Potential problems of the act; Jurisdiction; Economic principles of liability and financial responsibility for oil pollution; Oil pollution prevention and carrier liability; Economic models for analysis of problems; Relationships between cleanup costs and quantity of oil spilled; Measures of the potential economic loss from pollution; International trade implications of U.S. policies; The nature, behavior, and ecological effects of oil spills; Method for containment and cleanup of oil spills; and Oil pollution prevention and the characteristics of the oil industry production, transporting, and storage facilities. GRA

N71-33879* International Atomic Energy Agency, Vienna (Austria).

NUCLEAR ENERGY AND THE ENVIRONMENT Addendum to the Agency's Report to the Economic and Social Council of the United Nations for 1969-1970

[1970] 20 p refs

(INFCIRC/139/Add-1) Avail: NTIS

The application of nuclear energy to meet the power demands of an increasing population is discussed. The reduction in air pollution and improvement in environmental conditions is considered. The technology for containment and disposal of radioactive wastes is reported. Author

N71-35176* Atomic Energy Commission, Washington, D.C.

ENVIRONMENTAL CONSIDERATIONS IN THE REGULATORY PROCESS FOR PLANTS IN THE U.S.: THE ROLE OF THE PUBLIC AND PUBLIC UNDERSTANDING

James T. Ramey 13 Aug. 1971 25 p refs Presented at the Intern. Atomic Energy Agency Symp. on Environ. Aspects of Nucl. Power Plants, N. Y., 13 Aug. 1970

(IAEA-SM-146/5) Avail: NTIS

The proceedings of a conference on the licensing and control of nuclear power plants are presented. Subjects discussed are: (1) growth of electric power needs, public participation in regulatory procedures for nuclear reactor use, (3) reactor licensing, and (4) international cooperation. P.N.F.

N72-11844* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

WHAT CAN NUCLEAR ENERGY DO FOR SOCIETY?

Frank E. Rom Nov. 1971 24 p refs Presented at the 2nd Uranium Plasma Symp., Atlanta, 15-17 Nov. 1971; Sponsored by Am. Inst. of Aeron. and Astronautics

(NASA-TM-X-67963; E-6674) Avail: NTIS CSCL 05K

The utilization of nuclear energy and the predicted impact of future uses of nuclear energy are discussed. Areas of application in electric power production and transportation methods are described. It is concluded that the need for many forms of nuclear energy will become critical as the requirements for power to supply an increasing population are met. P.N.F.

N72-11846* Oak Ridge National Lab., Tenn.

THE ENVIRONMENT AND TECHNOLOGY ASSESSMENT Progress Report, Jun.-Dec. 1970

Feb. 1971 251 p refs

(Contract W-7405-eng-26; NSF Order AAA-R-4-70)

(ORNL-NSF-EP-3) Avail: NTIS

01 ENERGY SYSTEMS

A study of electrical energy consumption patterns, processes, and economics in highly developed countries is presented. The relationship between consumption of non-renewable resources and environmental degradation which occurs with an increase in energy consumption is discussed. Serious questions about the desirability as well as the practicality of continuing current patterns of energy consumption and growth are examined. Author

N72-13391* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FIFTH AEROSPACE MECHANISMS SYMPOSIUM

Washington 1971 196 p refs. Proceedings of conf. held in Greenbelt, Md., 15-16 Jun. 1970; sponsored by NASA. Goddard Space Flight Center, Santa Clara Univ., and Lockheed Missiles and Space Co.

(NASA-SP-282) Avail: NTIS CSCL 131

Structural design principles and mechanical engineering methods in developing various types of aerospace mechanisms used in orbital and space flights are reported. Topics include descriptions of an electromechanical docking mechanism attenuator, of various nutation dampers, and of numerous mechanical spacecraft subsystems.

N72-13968* Royal Swedish Academy of Engineering Sciences, Stockholm.

SWEDISH RESEARCH ON ENERGY AND ITS GLOBAL RELATIONSHIP

In its Develop. in Res. and Technol. during 1970 1970 p 116-150 refs. In SWEDISH (See N72-13942 04-34) Avail: NTIS; Almqvist & Wiksell, Stockholm: 25 Kr

N72-16982* United Nations, New York. Dept. of Economic and Social Affairs.

WORLD ENERGY REQUIREMENTS AND RESOURCES IN THE YEAR 2000

Jul. 1971 21 p refs. Presented at the 4th Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 6-16 Sep. 1971 (A/Conf-49/P-420; Conf-710901-439) Avail: AEC Depository Libraries

Existing long-term projections of energy demand at global and regional levels are reviewed. Long term factors influencing the demand for energy in countries in various stages of socio-economic development are assessed. Likely shifts in the demand for energy over the long term period in the light of various assumptions relating, among others to prospective economic growth rates, and to technological changes and innovations that may produce major shifts in the long term pattern of energy consumption are identified. Author (NSA)

N72-20371* Brookhaven National Lab., Upton, N.Y. ECOLOGICAL EFFECTS OF ENERGY: A BASIS FOR POLICY IN REGIONAL PLANNING

G. M. Woodwell and C. A. S. Hall [1971] 15 p refs (BNL-16228) Avail: NTIS

The ecological effects of energy and establishment of a basis for policy in regional planning are discussed. It is determined that the maintenance of the physical, chemical, and biotic integrity of the environment, regionally and earth wide, is a major consideration in planning any human activity and especially in planning for energy. Stability is an objective because the alternative, progressive degradation of the environment, is unacceptable. A wide spectrum of new laws governing the ecology may be required to produce the desired results. Author

N72-20948* RAND Corp., Santa Monica, Calif.

SIGNED DIGRAPHS AND THE GROWING DEMAND FOR ENERGY

Fred S. Roberts May 1971 62 p refs (Grant NSF GI-44)

(R-756-NSF) Avail: NTIS

An outline is given of a methodology which exploits the signed digraph for handling problems of forecasting energy demand and the effect of new technologies and institutions on that demand, and for generating and analyzing policy alternatives for meeting environmental constraints on energy use. The forecasting and policy problems are translated into signed digraph problems, and in particular to problems of so-called pulse processes on signed digraphs. Research problems related to the development of the methodology are described. Author

N72-23948* Committee on Science and Astronautics (U. S. House).

AN INVENTORY OF ENERGY RESEARCH, VOLUME 1

Washington GPO 1972 1110 p refs. Presented to the Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., 20 Feb. 1972

Avail: Subcomm. on Sci., Res., and Develop.

Evaluated are the needs of the United States of America for research and development related to the generation, transmission and utilization of energy. Considered are: general fossil fuels, coal, petroleum, natural gas, nuclear, plasma, hydraulic, solar, geothermal, wind, wood and other biological, chemical, and unspecified energy sources. G.G.

N72-25635* Oak Ridge National Lab., Tenn.

AN INVENTORY OF ENERGY RESEARCH, VOLUME 1

Jan. 1972 641 p refs. Prepared for NSF, Wash., D. C. (Contract W-7405-eng-26)

(ORNL-EIS-72-18-Vol-1) Avail: NTIS

Approximately 4400 research projects are listed by title under one of 14 categories of energy sources. These categories are: fossil fuels, general; coal; petroleum; natural gas; nuclear, general; nuclear fission; nuclear fusion and plasmas; hydraulic; solar; geothermal; wind; wood and other biological; chemical; and unspecified energy sources. Each of the 14 categories of energy sources is divided into eight stages for each source, starting with exploration, continuing through mining and extraction, concentration and refining, transportation, storage, conversion, distribution, and ending with use. Each of these eight stages is, in turn, subdivided into the six following fields of research: basic research; engineering development; economic; environmental; legislative/regulatory; and historical. NSA

N72-25929* Committee on Science and Astronautics (U. S. House).

BRIEFINGS, BEFORE THE TASK FORCE ON ENERGY OF SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT, VOLUME 2

Washington GPO 3 May 1972 185 p refs. Presented to the Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., 28 Mar. 1972

Avail: Subcomm. on Sci., Res., and Develop.

Briefings are presented on energy sources, resources, and research. Topics considered include the management and use of energy resources, transmission systems and networks, analysis and synthesis of energy systems, research opportunities and energy research needs, nuclear power, coal gasification, optimum uses of energy sources, and satellite solar power stations and power generation. K.P.D.

N72-25931* Committee on Science and Astronautics (U. S. House).

AN INVENTORY OF ENERGY RESEARCH

Washington GPO Mar. 1972 631 p. Presented to Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., Mar. 1972. Sponsored by NSF. Prepared by ORNL for Task Force on Energy of Subcomm. on Sci., Res., and Develop.

Avail: Subcomm. on Sci., Res., and Develop.

The indexes for Volume 1 are presented and include: simple

index on research institutes, simple index on sponsors, simple index on principal investigators, and permuted index on titles.

F.O.S.

N72-26971*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

ENERGY IN THE ENVIRONMENT AND THE SECOND LAW OF THERMODYNAMICS

Robert F. Mueller May 1972 9 p refs Submitted for publication

(NASA-TM-X-65912; X-644-72-130) Avail: NTIS HC \$3.00 CSCL 20M

The relationship between the consumption of energy by technological cultures and the second law of thermodynamics is discussed. The analysis is based on a description of the operation of a mechanical device which consumes energy. It is concluded that the flow of energy in manifold spontaneous conditions, which play a vital role in the operation of any technological process, remove most of the energy flow path from the control of the operator. It is stated that the increased efficiency of a process can benefit the environment only as much as this efficiency enables the total energy input to be reduced for a given level of production and increasing efficiency cannot meet the problems of an increased rate of energy utilization. Author

N72-30977# Committee on Interior and Insular Affairs (U. S. Senate).

ADVANCED POWER CYCLES

Washington GPO 1972 279 p refs Hearing pursuant to S. Res. 45 before Comm. on Interior and Insular Affairs, 92d Congr., 2d Sess., 8 Feb. 1972

Avail: Comm. on Interior and Insular Affairs

The hearings are reported concerned with new technologies for the environmentally acceptable generation of electricity from coal. The processes for the gasification of coal, and the problem in the removal of sulfur compounds are discussed. Summaries of the EPA activities in compliance with the Clean Air Act are included.

F.O.S.

N73-10980# Committee on Science and Astronautics (U. S. House).

BRIEFINGS BEFORE THE TASK FORCE ON ENERGY OF THE SUBCOMMITTEE ON SCIENCE, RESEARCH, AND DEVELOPMENT, VOLUME 2

Washington GPO Mar. 1972 185 p refs Briefings held in Oct. and Nov. 1971 presented to the Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., 21 Mar. 1972

Avail: Subcomm. on Sci., Res., and Develop.

The hearings concerning the research and development requirements for future national energy needs are reported. The optimal application of technology for the conservation of minerals, and the enhancement of environmental resources are discussed including: (1) power siting methodology, (2) utilization and disposition of rejected heat, (3) emissions reduction and management, (4) resources exploration and development methodology, and (5) efficient use of energy. Fast breeder reactors, solar arrays, and coal gasification are discussed as energy sources.

F.O.S.

N73-12707# Nowak (K.), Vienna (Austria).

PROJECT FOR OBTAINING CONTROLLED NUCLEAR FUSION. A NEW SYSTEM THAT SHOULD LEAD TO RAPID PRACTICAL USE FOR ENERGY PRODUCTION BY CONTROLLED NUCLEAR FUSION

K. Nowak [1972] 16 p refs In GERMAN (NP-19152) Avail: AEC Depository Libraries

The method described should make possible the technical evaluation of controlled nuclear fusion with positive energy balance and high efficiency for the energy production and, by creation of defined ratios, avoid the origin of neutron or tritium emission. For this method, the brief collision of plasmas of high ion density

formed from accelerated deuterium ions and electrons was proposed. The selected pulse times and accelerations permit the greatest possible efficiency of the fusion process. The bias against obtaining controlled nuclear fusion by collision of accelerated ions was based on the previous ratios for pure ion beams of usual plasma densities, but is erroneous for plasma beams of high density.

Author (NSA)

N73-12741# California Univ., Berkeley.

CRYOGENICS, SUPERCONDUCTING MAGNETS, AND FUSION POWER: A GLIMPSE INTO THE FUTURE

C. E. Taylor 29 Oct. 1971 24 p refs Presented at the Cryogenic Eng. Conf., Washington, D. C.

(UCRL-73187; Conf-710829-1) Avail: NTIS

The size, shape, and cost of several possible fusion-reactor coil systems are presented, along with refrigeration requirements. There is little question that these large magnet systems are technically feasible to construct. The economic possibility of using nonsuperconducting or partially superconducting hybrid conductors for large fusion systems is presented, and the possibility that there may not be enough helium available to refrigerate the coils in a hypothetical fusion-power economy eighty years from now is discussed briefly.

Author (NSA)

N73-13864* Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

POWER AND ENERGY FOR POSTERITY

Robert F. Barthelemy and Robert F. Cooper /in NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 355-359

CSCL 10B

The proceedings of a space congress held at Huntsville, Alabama during November 1971 are presented. The theme of the conference was Space for Mankind's Benefit. The subjects discussed were: (1) man in near-earth space, (2) fundamental benefits of the space program, (3) benefits of orbital surveys and space technology to environmental protection, (4) benefits to telecommunications, navigation and information systems, (5) benefits to future power generations and energy production, and (6) general technology utilization in the public sector.

N73-13870* Little (Arthur D.), Inc., Cambridge, Mass. Engineering Sciences Section.

POWER WITHOUT POLLUTION

Peter E. Glaser /in NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 431-439 refs

CSCL 10B

Details of several methods of converting solar energy to power without pollution are given. Data cover technical, economic, and social issues.

E.H.W.

N73-15339*# Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.

ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO

Bimonthly Progress Report, 1 Nov. 1972 - 1 Jan. 1973
Phillip Chase, Principal Investigator 1 Jan. 1973 5 p
(Contract NAS5-21762)
(E73-10003; NASA-CR-129927; Rept-73-141-079) Avail: NTIS HC \$3.00 CSCL 08I

The author has identified the following significant results. One result significant as a practical application and for cost benefit analysis is the relative ease with which ERTS-1 will monitor new and unclaimed stripping activities in Southeastern Ohio and in all of Appalachia. Band 5 resolution appears to be better than the often reported 80 meters. The strip mines stand out well enough to be easily identified without other graphic aids. Standing water within the strip mined area stands out in either bands 6 or 7. Areas of several acres are visible. Significant increases in surface extent of water of stripped areas should be detectable on a comparative basis. The degree of reclamation is

01 ENERGY SYSTEMS

observable in the imagery in rather gross percentage steps and for areas larger than the bare earth sizes in the table. The gradation in tones in the different bands indicates that probability density imagery using the four bands in CCT data (and statistical processing) is likely to separate degrees of vegetative reclamation.

N73-15693* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EMERGING NEEDS FOR MOBILE NUCLEAR POWER-PLANTS

John L. Anderson 1972 39 p refs Presented at Winter Meeting of the Am. Nucl. Soc., Washington, 12-17 Nov. 1972 (NASA-TM-X-68164; E-7224) Avail: NTIS HC \$4.00 CSCL 18E

Incentives for broadening the present role of civilian nuclear power to include mobile nuclear power plants that are compact, lightweight, and safe are examined. Specifically discussed is the growing importance of: (1) a new international cargo transportation capability, and (2) the capability for development of resources in previously remote regions of the earth including the oceans and the Arctic. This report surveys present and potential systems (vehicles, remote stations, and machines) that would both provide these capabilities and require enough power to justify using mobile nuclear reactor power plants. Author

N73-15699# European Atomic Energy Community, Ispra (Italy). Joint Nuclear Research Center.

HYDROGEN AS AN ENERGY VECTOR: NEW FUTURE PROSPECTS FOR APPLICATIONS OF NUCLEAR ENERGY

G. Beghi May 1972 20 p refs (EUR-4838) Avail: AEC Depository Libraries

In view of a wider penetration of nuclear energy in the energy field and therefore of a diversification of its applications, the usefulness of an intermediary energy vector is pointed out. Therefore hydrogen is examined as to its present potential uses in the future. Among the hydrogen production processes, the method of dissociation of water with a closed cycle of chemical reactions and utilizing nuclear heat seems particularly promising. Author (NSA)

N73-16766# California Univ., Livermore. Lawrence Livermore Lab.

SURVEY OF HYDROGEN'S POTENTIAL AS A VEHICULAR FUEL

A. L. Austin 19 Jun. 1972 35 p refs (Contract W-7405-Eng-48) (UCRL-51228) Avail: NTIS

The problems and potential of various hydrogen-based mobile fuel systems and the likely economic impact of a nationwide conversion to hydrogen are examined. The basic technical problem is to store enough hydrogen per vehicle in a small enough volume. The prospects of using gaseous and liquid hydrogen with air, liquid hydrogen with liquid oxygen, and hydrogen stored in metal hydrides in an internal combustion engine are analyzed. The practical feasibility is found to be marginal but with enough potential to justify an ongoing research program. Author

N73-17989# Committee on Science and Astronautics (U. S. House).

ENERGY RESEARCH AND DEVELOPMENT

Washington GPO 1972 730 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., no. 24, 9-11, 23-25, and 30 May 1970

Avail: Subcomm. on Sci., Res. and Develop.

The hearings concerning the Nation's critical energy needs are reported. The energy research and development which are discussed in terms of providing clean energy in quantities to meet the increasing demands. Topics discussed include: nuclear options, fossil fuel options, allocation of prime sources, solar radiation, energy consumption, fuel economy/efficiency, and coal gasification. F.O.S.

N73-18093# Army Foreign Science and Technology Center, Charlottesville, Va.

AUTONOMOUS ENERGETICS: ENERGY SOURCES FOR THE EARTH, SEA AND SPACE

26 Jun. 1972 5 p Transl. into ENGLISH from Khim. Zhizn (USSR), no. 10, 1970 p 34-36 (AD-753828; FSTC-HT-23-1088-72) Avail: NTIS CSCL 10/2

In February 1970, a general meeting of the Academy of Sciences of the USSR was held, devoted to the role of science in technical progress. In speaking of principal trends of development in modern science, the president of the Academy of Sciences, academician M. V. Keldysh mentioned the importance of work in the field of autonomous energetics. A member of the Academy of Sciences of the USSR, N. S. Lidorenko, told about the work that is going on in the development of physical and chemical energy sources. Author (GRA)

N73-20820# Mitre Corp., McLean, Va.

ENERGY, RESOURCES AND THE ENVIRONMENT

Charles A. Zrakat 24 Oct. 1972 40 p refs Revised (PB-213031; MITRE-72-180-Rev-2) Avail: NTIS HC \$3.75 CSCL 21D

A substantive summary of the eight symposia sponsored by MITRE on the interrelationships of energy, resources and the environment during the period July 1971 to July 1972 is presented. Author (GRA)

N73-20976# Committee on Commerce (U. S. Senate).

ENERGY RESEARCH AND DEVELOPMENT

Washington GPO 1972 380 p refs Hearings on Amendment 364 to S. 1684 before Comm. on Com., 92d Congr., 2d Sess., 15-16 Mar. 1972

Avail: Comm. on Com.

Senate hearings on the research and development of electric power production and related industries are reported. The objectives are to survey the need for and to appraise the workability of a Federal power research and development program and to assist private industry in ecologically constructive efforts to guarantee the present and future power needs of the U.S. J.M.M.

N73-20991# Mitre Corp., McLean, Va. Transportation Systems Engineering Dept.

US TRANSPORTATION: SOME ENERGY AND ENVIRONMENTAL CONSIDERATIONS

W. E. Fraize Sep. 1972 50 p refs (PB-213034; MITRE-72-164) Avail: NTIS HC \$3.75 CSCL 13B

The role of transportation in air pollution and consumption of energy, especially petroleum, is reviewed, with emphasis on the U.S. situation. Both technological and control measures for each problem area are discussed. Technological measures focus on the automobile, high speed ground transportation modes, and non-petroleum fuels, while control measures, which encourage the use of the more efficient transportation modes, are seen to offer significant benefits. The near future is discussed with respect to the impact of the U.S. Amended Clean Air Act of 1970. Transportation evolution over the next few decades is projected. Author (GRA)

N73-22711* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PRELIMINARY APPRAISAL OF HYDROGEN AND METHANE FUEL IN A MACH 2.7 SUPERSONIC TRANSPORT

John B. Whitlow, Jr., Richard J. Weber, and Kestutis C. Civinskas [1972] 51 p refs Prepared in cooperation with Army Air Mobility R and D Lab. Cleveland (NASA-TM-X-68222; E-7425) Avail: NTIS HC \$4.75 CSCL 21D

The higher heating value of hydrogen relative to JP fuel is estimated to reduce fuel weight by three fold and gross weight by 40 percent for comparable designed airplanes of equal payload and range. Engine design parameters were varied to determine

the influence of lower noise goals on gross weight and direct operating cost. At current fuel prices, the DOC of a hydrogen airplane would be much higher than that of a JP airplane. A methane airplane could offer an 8.5-percent lower KOC than JP. But future shortages may escalate the prices of both JP and methane, whereas the price of hydrogen manufactured hydrolytically could be reduced from present levels. If in the future all three fuels are postulated to have equal costs per unit of energy, the DOC for hydrogen could be as much as 20 percent below that for JP on the reference 4000-nautical-mile mission. Longer ranges or lower noise requirements would improve the advantage of hydrogen. Author

N73-22928# Committee on Science and Astronautics (U. S. House).

THE FEDERAL GOVERNMENT AND ENERGY RESEARCH AND DEVELOPMENT HISTORICAL BACKGROUND

Washington GPO Mar. 1973 111 p refs Presented by Subcomm. on Energy to the Comm. on Sci. and Astronaut., 93d Congr., 1st Sess., 20 Mar. 1973 Prepared by Library of Congr.

Avail: US Capitol, House Document Room

A congressional study is reported on the history of American energy production methods and techniques aimed at a comprehensive national energy research and development policy. Pertinent testimony was obtained from such authorities as the Department of the Interior, the National Bureau of Standards, the Federal Power Commission, the Tennessee Valley Authority, NASA, and sources from private industry. Results of the study revealed the need for a unified national policy directly sensitive to increased present and future power requirements. J.M.M.

N73-23962# RAND Corp., Santa Monica, Calif.

GROWTH RATES WITHIN THE TRANSPORTATION SECTOR

W. E. Mooz Jan. 1973 10 p Presented at Sem. on Energy as a Scarce Resource, Pasadena, Calif., 9 Dec. 1972; sponsored by Environ. Qual. Lab., the Sierra Club, and League of Women Voters

(P-4935) Avail: NTIS HC \$3.00

Report is made of an investigation into the nature of transportation in terms of energy depletion and fuel consumption. Graphic profiles are presented which trace the growth rates of specific modes of passenger and freight transportation from 1955 to 1968. A summary of likely transportation energy demands for the future is also included. J.M.M.

N73-23969# Committee on Science and Astronautics (U. S. House).

BRIEFINGS BEFORE THE TASK FORCE ON ENERGY, VOLUME 3

Washington GPO 1972 203 p refs Presented to Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., 15 Aug. 1972 Avail: Subcomm. on Sci., Res., and Develop.

The hearings concerning the energy problems of the U.S. are reported. Topics discussed include: environmental protection, better use of natural resources, R and D priorities, water and air pollution, electric power generation, and economic growth. F.O.S.

N73-24777*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THE USE OF HYDROGEN FOR AIRCRAFT PROPULSION IN VIEW OF THE FUEL CRISIS

Solomon Weiss 1973 38 p refs Presented at NASA Res. and Technol. Advisory Comm. on Aeronaut. Operating Systems, Moffett Field, Calif., 7-8 Mar. 1973

(NASA-TM-X-68242; E-7490) Avail: NTIS HC \$4.00 CSCL 21D

Some factors influencing the technical feasibility of operating a liquid hydrogen-fueled airplane are discussed in light of the

projected decrease of fossil fuels. Other sources of energy, such as wind, tidal, solar, and geothermal, are briefly mentioned. In view of projected decreases in available petroleum fuels, interest has been generated in exploiting the potential of liquid hydrogen (LH2) as an aircraft fuel. Cost studies of LH2 production show it to be more expensive than presently used fuels. Regardless of cost considerations, LH2 is viewed as an attractive aircraft fuel because of the potential performance benefits it offers. Accompanying these benefits, however, are many new problems associated with aircraft design and operations; for example, problems related to fuel system design and the handling of LH2 during ground servicing. Some of the factors influencing LH2 fuel tank design, pumping, heat exchange, and flow regulation are discussed. Author

N73-29368# Interior Dept., Washington, D.C.

ENVIRONMENTAL STATEMENT FOR THE PROPOSED PROTOTYPE OIL-SHALE LEASING PROGRAM. VOLUME 2: ENERGY ALTERNATIVES

Sep. 1972 228 p refs

(EIS-AA-72-5242-D-2-Vol-2) Avail: NTIS HC \$13.50

This section of the environmental impact statement discusses energy alternatives to the proposed action cast in the framework of the Proposed Prototype Oil-Shale Leasing Program. This prototype plan anticipates six test leases, two each in the States of Colorado, Utah, and Wyoming, and a program that might lead to a maximum total production of 1 million barrels of shale oil per day by the year 1985 from both public and private lands. This document discusses: (1) energy situation; (2) role of energy in economic growth; (3) energy requirements of the U.S. to meet projected future needs; (4) substitutability of energy forms; (5) factors that affect fuels development; (6) background of petroleum situation, both present and future; (7) oil-shale development possibilities; and (8) alternatives to the Proposed Prototype Oil-Shale Leasing Program. Author

N73-30975# Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland).

BIBLIOGRAPHIC COMPILATION AND TABULATION OF RESOURCES, OF THEIR CONSUMPTION AND THEIR WASTE IN THE WORLD [COMPILATION BIBLIOGRAPHIQUE ET TABULATION DES RESSOURCES, DE LA CONSOMMATION ET DES DECHETS DANS LE MONDE]

M. Roux Jul. 1973 66 p refs In FRENCH; ENGLISH summary

(LRP-63/73) Avail: NTIS HC \$5.50

The available resources of fossil and nuclear fuels as well as those of solar energy, hydroelectric power and others are reviewed and compared to the global consumption of energy in the world, the USA, the Common Market and Switzerland. The per capita and global consumption together with its growthrate, are presented and distributed with respect to primary energy sources and/or main sectors of use. Attention is focused on the energy required by the generation of electrical power. Estimates up to the year 2000 are also given. Due to a twofold increase both in the world population and in the per capita consumption, the energy demand by the year 2000 will be four times higher than its present level. Wastes from the nuclear economy are estimated up to the year 2000. The relative biological hazards pertaining to the radioactive inventories and wastes of fission reactors are compared to those of a reference fusion reactor. Author

N73-31867*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SIGNIFICANT ACCOMPLISHMENTS IN SCIENCES: GODDARD SPACE FLIGHT CENTER, 1972

Washington 1973 223 p Proc. of a Symp., Greenbelt, Md., 7-8 Nov. 1972

(NASA-SP-331) Avail: NTIS HC \$5.50 CSCL 05B

Space applications research is reported in the following areas: High energy and solar astronomy; optical and UV astronomy; Planetary, lunar, and cometary studies; earth observations; and earth physics.

01 ENERGY SYSTEMS

N73-31900* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

EARTH OBSERVATIONS, OVERVIEW

William Nordberg *In its Significant Accomplishments in Sci.* 1973 p 161-177
CSCL 08E

An overview is given of research and development activities at the Laboratory for Meteorology and Earth Sciences. Highlights of satellite techniques in earth observation missions and projects are outlined, as are remote sensing methods by aircraft overflights; most noteworthy among these is the development of multispectral scanners that monitor both the reflected infrared solar radiation and the emitted terrestrial radiation. The application of observations to the survey of environmental conditions and resource management is emphasized. G.G.

N73-33005# California Univ., Livermore. Lawrence Livermore Lab.

DEVELOPMENT OF MATERIALS FOR ENERGY RELATED APPLICATIONS

J. S. Kane 10 Apr. 1973 16 p refs Presented at 2d Cairo Solid State Conf., Cairo, 21-26 Apr. 1973 Sponsored by AEC (UCRL-74697; Conf-730416-2) Avail. NTIS HC \$3.00

The application of materials science and technology to develop new energy sources and to make current energy systems more efficient is discussed. The energy sources discussed include solar energy, thermonuclear energy, and fossil fuel energy. Energy conversion techniques discussed include thermal cycles, solar photovoltaic, thermal decomposition of water, and hydrogen-air fuel cells. The methods for energy transmission that are outlined are hydrogen pipelines and superconducting or cryogenic electrical transmission lines. Transportation optimization and efficiency are dealt with in the light of those components yielding the largest benefit for the overall system. NSA

N73-33928# Committee on Science and Astronautics (U. S. House).

SHORT TERM ENERGY SHORTAGES

Washington GPO 1973 928 p refs Hearings before Comm. on Sci. and Astron., 93d Cong., 1st Sess., No. 7, 3, 8 and 17 May 1973

Avail: Subcomm. on Energy

Congressional hearings are given on the causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet engine fuel, and electricity. The immediate energy shortages and policy options are discussed in three parts: (1) the character of the present energy crisis, (2) the relationship of energy growth and economic growth, and (3) the relationship of short-run measures and long-term objectives. Short term fuel shortages are given along with their effects on the electric utilities. The hearings take into account the regulated energy industries and the effect of the present situation on energy research and development. A gas field identification list is included. T.M.R.

02 SOLAR ENERGY

Includes solar collectors and solar cells; efforts to achieve practical and economical use of solar energy for heating and cooling of buildings, heating or water, generation of electricity, and production of clean fuel.

A68-12549

DETERMINATION OF THE OPTIMAL DIMENSIONS OF HIGH-TEMPERATURE CYLINDRICAL-CAVITY SOLAR ENERGY RECEIVERS.

I. M. Rubanovich (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, Kishinev, Moldavian SSR).

(Geliotekhnika, vol. 1, July-Aug. 1965, p. 11-22.)

Applied Solar Energy, vol. 1, July-Aug. 1965, p. 9-20. 18 refs. Translation.

Examination of the operation of the concentrator and receiver of a high-temperature cylindrical-cavity solar energy receiver for determining the optimal dimensions of such a receiver. The concentrator studied was of the paraboloidal mirror type. As part of the optimization process, receiver losses associated with the escape of radiant energy from the receiver inlet and the mean coefficient of irradiation of the cavity inlet from its inner surface had to be determined. Several means for increasing the efficiency of receivers are presented.

R. B. S.

A68-15419

TECHNOLOGY AND ELECTRICAL CHARACTERISTICS OF GALLIUM ARSENIDE SOLAR CELLS [TECNOLOGIA E CARATTERISTICHE ELETTRICHE DI CELLE SOLARI AD ARSENIURO DI GALLIO].

F. P. Califano (Napoli, Università, Istituto di Elettrotecnica, Naples, Italy) and P. Spirito.

Rivista di Ingegneria, Nov. 1967, p. 924-929. 12 refs. In Italian.

Research supported by the Consiglio Nazionale delle Ricerche.

Description of the technological processes used in the construction of type III-V GaAs solar cells with an actual conversion efficiency of approximately 10%. The properties of gallium arsenide are briefly reviewed, and the characteristics of the components constructed with it are described.

M. M.

A68-15882

KAUFMAN POWER PLANTS WITH SOLAR CELLS - ENERGY-SUPPLY DEVICES FOR MISSIONS IN THE NEAR FUTURE [KAUFMAN-TRIEBWERKE MIT SOLARZELLEN-ENERGIEVERSORGUNGSANLAGEN FÜR ZUKUNFTSNAHE MISSIONEN].

G. F. Au.

Luftfahrttechnik Raumfahrttechnik, vol. 13, Dec. 1967, p. 305-310. 29 refs. In German.

Description of the Kaufman electrical generator to be used in conjunction with solar cells for the production of power in the 2 to 4-kw range. The SERT II mission - an earth-orbiting mission scheduled for 1969 - will be characterized by the use of the Kaufman generator. The mercury fuel system, discharge chamber, acceleration system, and plasma-bridge neutralizing cathode are examined.

R. B. S.

A68-16784 *

CONFIGURATION SELECTION AND PERTURBATION EFFECTS FOR A LARGE ORBITING SOLAR ARRAY.

J. Rebman (Radio Corporation of America, Defense Electronic Products, Astro-Electronics Div., Princeton, N.J.).

IN: SATURN V/APOLLO AND BEYOND: NATIONAL SYMPOSIUM, HUNTSVILLE, ALA., JUNE 11-14, 1967, TRANSACTIONS. VOLUME 2.

Symposium sponsored by the American Astronautical Society, the University of Alabama, NASA, and the U.S. Army.

Edited by S. S. Hu.

Tarzana, Calif., American Astronautical Society, 1967. 17 p.

Contract No. NAS 9-5266.

Discussion of the development of an optimum array-spacecraft configuration, representing one of the prime problems encountered in the design of a large orbiting solar array. After establishing the mission parameters (power requirements, orbit parameters, booster selection, and spacecraft orientation requirements), various array configurations are analyzed with respect to packaging constraints, mechanical integrity, and orbiting perturbation effects. One or more array configurations are then selected based on fuel consumption resulting from perturbation effects, array shadowing, array dynamical behavior, and possible constraints on the mission due to the configuration. A large number of configurations were considered with two basic types selected for further detailed analysis. Of these, one was selected to minimize orbital fuel consumption, place minimum constraints on mission goals, and perform satisfactorily at the required altitudes.

P. v. T.

A68-17380 *

A SOLAR ARRAY OPTIMAL POWER CONVERSION TECHNIQUE.

Robert Rosen (Hughes Aircraft Co., Aerospace Group, Culver City, Calif.).

(Institute of Electrical and Electronics Engineers, Aerospace and Electronic Systems Technical Convention, Washington, D.C., Oct. 16-18, 1967, Paper.)

IEEE Transactions on Aerospace and Electronic Systems, Supplement, vol. AES-3, Nov. 1967, p. 504-510.

Contracts No. NAS 5-9210; No. NAS 5-10225.

Description of a technique for efficiently coupling the maximum power available from a solar array to a spacecraft battery. Conversion of power was accomplished by using high-efficiency switching techniques. The power was coupled through a transformer which had a known primary inductance. Optimum power convergence was afforded over a wide range of input and output conditions, due to the flexibility provided by this technique. The derivation of the design equations and their subsequent verification by the design and construction of two working units are described. The two cases considered were felt to be representative of many conceivable system configurations. Incorporation of this technique into the power-system design for many types of spacecraft could result in an overall reduction in size and weight for the vehicle. The high efficiency of the power-coupling circuits may also increase the probability of mission success, because of the low component stresses in these areas.

F. R. L.

A68-18449

OPTICAL CHARACTERISTICS OF SILICON PHOTOCELLS AND THE EFFICIENCY OF A THERMAL PHOTOELECTRIC CONVERTER [OPTICHESKIE KHARAKTERISTIKI KREMNIYEVYKH FOTOELEMENTOV I K.P.D. TERMOFOTOELEKTRICHESKOGO PREOBRAZOVATEL'IA].

A. M. Vasil'ev, T. M. Golovner, A. P. Landsman, and N. S. Lidorenko.

Teplotfizika Vysokikh Temperatur, vol. 5, Nov.-Dec. 1967, p. 1079-1086. 8 refs. In Russian.

Experimental investigation of the optical characteristics of conventional silicon photocells of the type employed in thermophotovoltaic converters. The efficiency of such converters is studied as a function of the optical characteristics. It is shown that an efficiency of roughly 10% can be expected from modern silicon photocells using an emitter with a temperature of 1900°C. Given particularly favorable optical characteristics, the efficiency can be as high as 25%. V. P.

A68-20595

AIR FORCE ADVANCED SOLAR TURBO ELECTRIC CONCEPT.

Jerome Werbel and Charles L. Midyett (USAF, Systems Command, Research and Technology Div., Aerospace Propulsion Laboratory, Wright-Patterson AFB, Ohio).

(USAF, Office of Scientific Research and United Aircraft Corp., Symposium on Advanced Propulsion Concepts, 4th, Palo Alto, Calif., Apr. 26-28, 1965, Paper.)

IN: ADVANCED PROPULSION CONCEPTS; PROCEEDINGS OF THE FOURTH SYMPOSIUM, PALO ALTO, CALIF., APRIL 26-28, 1965.

Symposium sponsored by the Office of Scientific Research of the U.S. Air Force and the United Aircraft Corp.

New York, Gordon and Breach, Science Publishers, Inc., 1966, p. 207-222; Discussion, p. 223, 224. 11 refs.

02 SOLAR ENERGY

Discussion of the Advanced Solar Turbo Electric Concept (ASTEC) for satisfying the growing needs for space vehicle power requirements. Conversion of solar energy to usable electrical output by a solar dynamic energy-conversion system aboard a space vehicle requires a collector, heat receiver, energy-conversion devices, and radiator. The collector concentrates the solar flux into a heat receiver unit. In the heat receiver, the heat transmitted by the collector is transferred to the working fluid, raising its energy level. The working fluid is then admitted to the first energy-conversion device (turbine), where the heat energy is converted to kinetic energy in the form of shaft power. This power drives the second energy-conversion device (alternator), which produces a useful electric output. Meanwhile, the working fluid enters the radiator where it gives up its excess energy to space. From the radiator the working fluid is then pumped back into the heat receiver for the beginning of another Rankine cycle. S.H.B.

A68-20738

RECENT PROGRESS OF THIN FILM SOLAR CELLS.

David M. Perkins (Northern College of Applied Arts and Technology, Ontario, Canada).

Advanced Energy Conversion, vol. 7, Feb. 1968, p. 265-274. 20 refs.

Detailed discussion of the material used in the production of thin-film solar cells, such as CdS, CdTe, and GaAs. The fabrication, structure, and properties of these cells are described and related to their solar conversion efficiency, specific power-to-weight ratio, and environmental stability. In addition, the characteristics of these thin-film cells are discussed with respect to practical space applications. R.B.S.

A68-22516 *

SOLAR COLLECTION LIMITATIONS FOR DYNAMIC CONVERTERS.

George L. Schrenk (Pennsylvania, University, Philadelphia, Pa.).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 25-44; Discussion, Touchais, p. 45, 46. 23 refs. Discussion in French.

Research supported by the General Motors Corp.; Grant No. NSG-316.

Analysis of actual solar collectors on the basis of a mathematical model which makes it possible to calculate the energy flux on any arbitrarily shaped focal surface from any arbitrarily shaped collector surface without making numerical approximations. This model has recently been used to investigate the interface between the collector and the heat receiver (the cavity opening). The directional assumption often made for this interface is that this opening can be treated as if it were a plane surface emitting radiation according to Lambert's law (the cosine law). Results are given which clearly show that this assumption is in substantial error for both perfect and imperfect collectors. Cylindrical heat receivers coupled with typical reflectors are analyzed in detail, using an open-cavity Fredholm integral equation approach and the valid directional distribution. The effects of the absorptivity and emissivity of the walls of the heat receiver are investigated, and the reradiation losses and system performance are calculated. T.M.

A68-22525

LIMITATIONS OF SOLAR COLLECTORS FOR CONVERTERS [LIMITATIONS DES COLLECTEURS SOLAIRES POUR CONVERTISSEURS].

F. Trombe (Centre National de la Recherche Scientifique, Laboratoire de l'Energie Solaire, Mont-Louis, Pyrénées-Orientales, France) and E. Le Grives (ONERA, Châtillon-sous-Bagneux, Hauts-de-Seine, France).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES,

FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 279-312; Discussion, G. L. Schrenk (Pennsylvania, University, Philadelphia, Pa.) and Touchais, p. 312-314. 22 refs. In French; Discussion in English and French.

Account of research on solar-energy collectors and receivers for space applications. Various concentrator concepts are reviewed, and receiver configurations leading to the most promising performances are defined. The main factors affecting collector efficiency (geometrical perfection, optical qualities, structural rigidity, and response to meteorite impacts) and receiver efficiency (absorption characteristics and surface radiation) are analyzed. M.F.

A68-31623

INVESTIGATIONS ON SILICON P-N JUNCTION FOR SOLAR ENERGY CONVERSION.

R. B. Gangadhar, R. S. Mathur, H. K. Sehgal, and Arun P. Kulshreshtha (Indian Institute of Technology, Dept. of Physics, New Delhi, India).

(Council of Scientific and Industrial Research, Convention, Banaras Hindu University, Varanasi, India, Mar. 1967.)

Indian Journal of Pure and Applied Physics, vol. 5, Dec. 1967, p. 593-595. 5 refs.

Research supported by the Council of Scientific and Industrial Research.

Phosphorus and boron diffused solar cells have been fabricated. A simple technique is developed for providing ohmic meshed contacts for samples. Study of various characteristics has shown the superiority of boron diffused solar cells over phosphorus diffused ones. (Author)

A68-33039

SOLAR CELLS FOR ONBOARD ENERGY SUPPLY IN SPACE VEHICLES [SOLARZELLEN ZUR BORDENERGIEVERSORGUNG VON RAUMFLUGKÖRPERN].

E. Hollax.

Astronomie und Raumfahrt, no. 1, 1968, p. 6-10. 6 refs. In German.

Brief examination of the characteristics of and advantages offered by the solar cell as a means of energy supply in spacecraft. The design, operation, and power output of various cells are discussed, and the critical particle bombardment for different types of cells is outlined. It is seen that for short operational times the p/n silicon cell is to be preferred, while for long periods of time the n/p silicon cell is better adapted. R.B.S.

A68-34613

THE CdS THIN FILM SOLAR CELL.

F. A. Shirland (Clevite Corp., Electronic Research Div., Solar Battery Section, Cleveland, Ohio).

IN: SEMICONDUCTOR COMPONENTS AND INTEGRATED CIRCUITS; VERBAND DEUTSCHER ELEKTRONIKER, CONFERENCE OF ELECTRONIC SPECIALISTS, HANOVER, WEST GERMANY, MAY 2, 3, 1968, PROCEEDINGS [HALBLEITER-BAUELEMENTE UND INTEGRIERTE SCHALTUNGEN; VERBAND DEUTSCHER ELEKTRONIKER, FACHTAGUNG ELEKTRONIK, HANOVER, WEST GERMANY, MAY 2, 3, 1968, PROCEEDINGS].

Hanover, West Germany, Deutsche Messe- und Ausstellung AG, 1968, p. 14-21. 6 refs. In German.

Description of a CdS thin-film solar cell designed as a more advanced alternative to the conventional silicon photovoltaic cell for converting light into electric energy. The advantages of the new cell are a simpler polycrystal deposition process, cell activation by a simple chemical conversion of the CdS surface into Cu₂S, high flexibility and ruggedness of the device, and feasibility of low-cost mass fabrication. It is indicated that the favorable results obtained on recent meteorological balloon flights have increased the demand for the new solar cell. V.Z.

A68-38889 ***TECHNOLOGY OF LARGE (1 KW TO 5 KW) SOLAR ARRAYS.**

Karl Martinez and Edgar W. Miles (Boeing Co., Aerospace Group, Space Div., Seattle, Wash.).
(Deutsche Gesellschaft für Raketentechnik und Raumfahrt, Symposium über Energieversorgung im Weltraum II, Munich, West Germany, Mar. 14, 1968.)
Raumfahrtforschung, vol. 12, July-Sept. 1968, p. 138-142.
NASA-sponsored research.

Description of the manufacture of rigid modular deployable solar arrays. Areas covered include cell types, cell thickness, packaging and connection of cells, structures for the rigid deployable array, the assembly of the array, and solar cells grouping. Future trends in the technology of solar cells are briefly considered.

R.B.S.

A68-39356**OPTICAL CHARACTERISTICS OF SILICON PHOTOCELLS AND THE EFFICIENCY OF A THERMOPHOTOELECTRIC CONVERTER.**

A. M. Vasil'ev, T. M. Golovner, A. P. Landsman, and N. S. Lidorenko.
(*Teplotfizika Vysokikh Temperatur*, vol. 5, Nov.-Dec. 1967, p. 1079-1086.)

High Temperature, vol. 5, Nov.-Dec. 1967, p. 967-973. 8 refs.
Translation.

Experimental investigation of the optical characteristics of conventional silicon photocells of the type employed in thermophotovoltaic converters. The efficiency of such converters is studied as a function of the optical characteristics. It is shown that an efficiency of roughly 10% can be expected from modern silicon photocells using an emitter with a temperature of 1900°C. Given particularly favorable optical characteristics, the efficiency can be as high as 25%. V.P.

A68-40644**PHYSICAL PROBLEMS CONNECTED WITH THE STUDY OF ELECTROMAGNETIC ENERGY, PARTICULARLY OF THE SUN [PROBLEMI FISICI CONNESSI CON LO STUDIO DELL'ENERGIA ELETTROMAGNETICA, IN PARTICOLARE DEL SOLE].**

Franco Valli.
Rivista Aeronautica, Supplemento Tecnico, 1968, p. 153-182.
In Italian.

Discussion of physical phenomena and problems connected with the study of electromagnetic energy. The possibility of transforming solar energy into electric power is examined, and the trends of current investigations of the uses and methods of conversion of solar energy are briefly reviewed.

M.M.

A68-41092 #**EXPERIMENTAL MEASUREMENTS OF CONCENTRATED SOLAR ENERGY PATTERN IN FOCUS OF A PLANE SEGMENTS CONCENTRATOR.**

I. A. Sakr and N. H. Helwa.
Coopération Méditerranéenne pour l'Energie Solaire, Bulletin no. 14, July 1968, p. 27-35. 6 refs.

Determination of the pattern of radiant energy distribution and temperature for a parabolic-cylinder concentrator constructed from plane mirror segments. The ratio of the coefficient of the radiation concentration at the focus to the aperture of the concentrator is determined. A steady-state heat-balance equation is presented for the concentrator. The characteristics of the focal plane of the concentrator are studied.

M.G.

A68-41941**SOLAR CELLS AND SOLAR-CELL GENERATORS FOR SPACE TRAVEL [SOLARZELLEN UND SOLARZELLENGENERATOREN FÜR DIE RAUMFAHRT].**

Siegfried Karius.
Technische Mitteilungen AEG-Telefunken, vol. 58, no. 2, 1968, p. 71-73. In German.

Assessment of solar cells, which convert light directly into energy, and are used as a power supply for spacecraft. After a short discussion of their potential, the properties of solar cells and the influence of particle radiation and temperature on the characteristics of these cells are described. The structure of generators consisting of solar cells is sketched, and a summary of the R&D plans of the AEG-Telefunken of Germany in the fields of solar cells and solar-cell generators is given.

P.v.T.

A68-42318 ***STATUS OF THE CADMIUM SULFIDE THIN-FILM SOLAR CELL.**

F. A. Shirland (Clevite Corp., Cleveland, Ohio), A. F. Forestieri, and A. E. Spakowski (NASA, Lewis Research Center, Cleveland, Ohio).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD. VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 112-115. 7 refs.

A brief description is given of the design of the cadmium sulfide thin-film solar cell as it has evolved to date for space applications. The performance levels achieved are summarized along with the degree of reproducibility and yields obtained on pilot production in recent months. Improvements in design and performance presently being investigated are also discussed. A summary of the results of testing of cadmium sulfide thin-film solar cells is presented. These include cells subjected to the following conditions: wet shelf storage, dry shelf storage, vacuum thermal storage, and vacuum thermal cycling.

(Author)

A68-42560 ***A DESIGN CONCEPT FOR A 30 WATTS PER POUND ROLLUP SOLAR ARRAY.**

N. F. Shepard, Jr. and K. L. Hanson (General Electric Co., Philadelphia, Pa.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD. VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 549-559.
Contract No. JPL-951970.

A design concept for a 250-ft² rollup solar array system which has a power-to-weight ratio in excess of 30 W/lb is described. The tradeoff studies and analyses which led to the selection of a single deployable boom configuration are discussed. The structural stability of the deployed array is obtained by tension applied to the array substrate. An analytical model of the deployed array is formulated to determine the substrate preload required to obtain a specified first-mode natural frequency of greater than 0.04 Hz. The design of each major component is described.

(Author)

A68-43817**THE INFLUENCE OF COLLECTOR TEMPERATURE ON THE MAXIMUM EFFICIENCY OF A THERMIONIC CONVERTER IN THE SERIES BATTERY.**

Krzysztof Urbaniec and Maciej Zgorzelski (Warszawa, Politechnika, Instytut Techniki Ciepłej, Warsaw, Poland).
Energy Conversion, vol. 8, Sept. 1968, p. 103-110. 11 refs.

Analysis of the influence of the collector temperature on the maximum obtainable efficiency of an ideal thermionic converter. It is shown that the maximum obtainable efficiency of an ideal thermionic converter (i.e., the efficiency calculated with all heat losses from the emitter taken into account, but without any plasma losses) may be higher in a converter operating at high collector temperatures than in the negligible collector emission case. It is also proved that above certain temperatures of the collector, low work function of its surface does not represent any advantages in respect to converter efficiency and that for a given value of collector work function and emitter temperature, there exists always an optimum collector temperature which maximizes the efficiency. For a collector work function of 1.8 eV, optimum collector temperature is about 900°C when emitter temperatures are high.

Z.W.

02 SOLAR ENERGY

A69-12296

POWER FROM THE SUN - ITS FUTURE, Peter E. Glaser (Arthur D. Little, Inc., Engineering Sciences Section, Cambridge, Mass.). (Intersociety Energy Conversion Engineering Conference, Boulder, Colo., Aug. 13, 1968.) Science, vol. 162, Nov. 22, 1968, p. 857-861. 16 refs.

Discussion of solar energy as the major future fuel resource, and evaluation of means for harnessing it to produce power on earth. The estimated surface area and estimated weight of satellite solar collectors for different photovoltaic energy-conversion devices of different efficiency, exclusive of the weight of structural components, are shown. It is pointed out that, although the use of satellites for conversion of solar energy may be several decades away, it is possible to explore several aspects of the required technology as a guide to future developments. M.M.

A69-15675 *

DESIGN AND PERFORMANCE ANALYSIS OF PANEL-TYPE SOLAR THERMOELECTRIC GENERATORS.

V. Raag (Radio Corporation of America, RCA Electronic Components and Devices Div., Harrison, N.J.).

Energy Conversion, vol. 8, Dec. 1968, p. 169-176. 9 refs. Contract No. NAS 3-10600.

Derivation of performance equations for a panel-type solar thermoelectric generator, basing all calculations on a single thermocouple as the fundamental unit of the generator. Results show that the performance of the thermocouple is determined by initially assuming arbitrary dimensions for the various components. In a practical power generator, however, it is important that this performance be optimized with respect to some parameter, such as specific power (W/lb), or efficiency, which is directly related to the economics of producing the electrical power for space applications. This optimization should be made through a variation of parameters. Each parameter can be varied independently by fixing the values of the remaining parameters, thus achieving optimization for all parameters. This process is conveniently accomplished with a computer program. B.H.

A69-21823 *

ELECTRICAL TESTING OF A SIX-CONVERTER GENERATOR.

G. Stapfer and K. Shimada (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ANNUAL THERMIONIC CONVERSION SPECIALIST CONFERENCE, 7TH, FRAMINGHAM, MASS., OCTOBER 21-23, 1968, CONFERENCE RECORD. New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 159-163.

Electrical testing of a solar energy thermionic generator (JG-4) was performed as a part of generator evaluation that includes the solar testing. The generator consists of six individual converters (SET-type) mounted radially on a cylindrical cavity to receive equal amounts of incoming thermal flux. The maximum output power was 140 W at an output voltage of 3.0 V, with an overall efficiency of approximately 4.5%. These results were obtained at an emitter temperature of 1700°C, which was lower than desired, and at collector temperatures higher than expected. During the electrical testing of the JG-4, anomalies were noted, namely: (1) overheating of collectors and metal-ceramic seals, and (2) a dual-current mode of generator operation. The first occurred because the available surface area, as dictated by a geometrical constraint of the generator configuration, was inadequate for radiative heat dissipation. The second anomaly was caused by the simultaneous occurrence of an ignited mode and an unignited mode in the six series-connected converters. (Author)

A69-22534

COMPUTATION AND OPTIMIZATION OF THE THERMAL REGIME IN CONCENTRATOR-TYPE SOLAR DEVICES.

R. A. Zakhidov and D. I. Teplakov (Akademiia Nauk SSSR, Energeticheskii Institut, Moscow, USSR). (Geliotekhnika, vol. 2, no. 2, 1966, p. 12-19.)

Applied Solar Energy, vol. 2, Mar.-Apr. 1966, p. 8-16. 9 refs. Translation.

Computation of the energy distribution over randomly oriented elements of the radiation receiving surface of the hollow collector of a concentrator-type solar device. The energy distribution characteristics in the specular reflection field of a real paraboloidal concentrator are fully established by a structural solution of the energy transfer and distribution problem. Expressions for the radial and axial components of the reflected radiation vector are given, together with expressions which enable the more general laws of radiation field theory to be applied to the field specularly reflected from the paraboloidal mirror of a solar device. Radiant flux measurements necessary to the investigation of the structural characteristics of the concentration field are made, using the calorimetric method. It is shown that the level and distribution of energy over the elements of the collector wall constitute the prime factor in thermal regime optimization of the collectors under consideration. M.G.

A69-27465

GALLIUM ARSENIDE PHOTOELECTRIC DETECTION DEVICES [AR-SENOWO-GALOWE FOTOELEKTRYCZNE PRZYRZĄDY ODBIORCZE]. Michał Korwin-Pawłowski (Polska Akademia Nauk, Instytut Technologii Elektronowej, Warsaw, Poland).

Przegląd Elektroniki, vol. 10, no. 3, 1969, p. 105-116. 18 refs. In Polish.

Review of the present state of knowledge of gallium arsenide photoelectric devices for radiation detection and light-to-electric energy conversion. The design, fabrication techniques, and properties of various kinds of photoresistors, photodiodes, and solar cells made of GaAs are described. Z.W.

A69-29261

ACTION OF RADIATION ON THE FUNCTIONING OF THERMIONIC CONVERTERS - CONVERSION OF SOLAR RADIATION [ACTION DU RAYONNEMENT SUR LE FONCTIONNEMENT DE CONVERTISSEURS THERMOIONIQUES - CONVERSION DU RAYONNEMENT SOLAIRE].

J. P. David and F. Floret (Aix-Marseille, Université, Faculté des Sciences, Marseille, France).

IN: INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency. Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969, p. 1219-1224. 6 refs. In French.

Study of the possibility of displacing the functioning point of a cesium thermionic converter by causing the interaction of a visible or near-ultraviolet radiation with alkaline atoms to complete neutralization of the space charge by creation of supplementary ions. Various mechanisms are examined: direct photoionization, ionization by stages, ionization by electrons, and action on surface ionization. Experimentally, two effects were observed while illuminating the interelectrode space of the converter with the radiation issuing from a flash on xenon: a reversible effect for low emitter temperature regimes, and an irreversible effect with priming of the arc regime under other conditions of functioning. Solar applications are considered, and a pilot model is described. F.R.L.

A69-30034

EFFICIENCY CALCULATIONS OF HETEROJUNCTION SOLAR ENERGY CONVERTERS.

A. K. Sreedhar, B. L. Sharma, and R. K. Purohit (Solid State Physics Laboratory, Delhi, India).

IEEE Transactions on Electron Devices, vol. ED-16, Mar. 1969, p. 309-312. 17 refs.

Theoretical evaluation of the maximum attainable solar conversion efficiencies of p-n and n-p heterodiodes. The calculations are made for some of the theoretically efficient and feasible heterojunctions of IV and III-V group semiconductors. In these calculations, the Anderson diffusion model is used and carrier concentrations of the two semiconductors are so chosen that photocarriers

generated do not have to surmount any junction barrier. The calculated efficiencies are compared with the reported experimental values and with the conventional Si photovoltaic cell. P. v. T.

A69-31287

THIN FILM SOLAR CELLS FOR BALLOON APPLICATIONS.

Fred A. Shirland (Clevite Corp., Cleveland, Ohio).
IN: INSTRUMENT SOCIETY OF AMERICA, ANNUAL CONFERENCE, 23RD, NEW YORK, N. Y., OCTOBER 28-31, 1968, PROCEEDINGS.

Pittsburgh, Instrument Society of America (Advances in Instrumentation. Volume 23. Part 1), 1968, p. 804 1-804 5.

Description of some recent applications of CdS thin-film solar cells for supplying power for instrumentation and data telemetry on longer-lived balloons. The design of the power systems of meteorological balloons and scientific experimental balloons is outlined. In the last few years, a new type of solar cell has been developed. It is a large-area thin-film device, which is particularly advantageous for balloon applications. It is made from a polycrystalline layer of cadmium sulfide, which is deposited on a metallized plastic film, and is only 4 mils thick. It is flexible enough to withstand repeated bending to less than 1/4-in. radius without damage. Its large size requires fewer cells for a complete system. These attributes make it possible to fabricate large panels that are extremely rugged and reliable. P. v. T.

A69-32797 =

OPTIMUM OPERATING CONDITIONS OF A SOLAR THERMOELECTRIC GENERATOR WITH THERMAL CONTACTS [OPTIMAL'NYI REZHIM RABOTY SOLNECHNOGO TERMOELEKTRONENNOGO PRIKLYUCHENIYA TEPLOVYKH KONTAKTOV].

B. Arazmedov (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR).
Geliotekhnika, no. 2, 1969, p. 3-8. In Russian.

Discussion of the influence of thermal contacts on the optimum operating conditions of a solar thermoelectric power generator, with particular reference to the thermal and electric losses arising due to the low thermal conductivity coefficient of the insulating layers between the panels and the thermopile. A heat balance equation for determining the temperature at the cold side of the junction is derived which takes into account the thermal contacts and the thermal resistance of the insulating layers between the thermocouples. Graphs showing the optimum concentration of solar rays as a function of the junction temperature are included. V. P.

A69-32798

REFLECTOR CHARACTERISTICS OF A SOLAR POWER INSTALLATION WITH PHOTOELECTRIC CONVERTERS [KHARAKTERISTIKI KONTSENTRATORA SOLNECHNOI ENERGETICHESKOI USTANOVKI S FOTOPREOBRAZOVATEL'NAMI].

B. Ia. Rodichev and B. V. Tarnizhevskii (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Istoknikov Toka, Kishinev, Moldavian SSR).

Geliotekhnika, no. 2, 1969, p. 9-15. In Russian.

Discussion of the characteristics of a faceted reflector used in solar power installations with photoelectric converters. The analysis is performed for a reflector consisting of thirteen 50-mm facets arranged along the half-width of a parabola. The efficiency and energy balance of the reflector are determined. Optimization considerations indicate that the reflector efficiency can be increased from 0.75 to 0.8. V. P.

A69-32799

ANALYSIS OF RADIANT TRANSFER PROCESSES IN CYLINDRICAL CAVITY-TYPE RECEIVERS OF SOLAR INSTALLATIONS [ANALIZ PROTSESSOV LUCHISTOGO OBMENA V TSILINDRICHESKIKH POLOSTNYKH PRIEMNIKAKH GELIOUSTANOVOK].

V. A. Grilikhs and F. V. Obtemperanskii.
Geliotekhnika, no. 2, 1969, p. 40-48. 18 refs. In Russian.

Theoretical and experimental study of the influence of reradiation and multiple reflection on the distribution of the resulting radiant

fluxes in cylindrical receivers of solar power installations. It is shown that, at moderate operating temperatures, the flux density distribution over the receiving surface is almost unaffected either by the self-radiation of the receiver walls or by the wall temperature variations. The main radiant losses in such receivers are due to reflection from the cavity, so that a low wall reflection coefficient is desirable. Cavity aspect ratios between 3 and 4 are optimum for minimizing radiant losses. V. P.

A69-33795

SOLAR CONCENTRATION POWER AND OPTIMIZATION OF THE CAVITY TYPE HEATER FOR A SOLAR SOURCE.

Widen Tabakoff (Cincinnati, University, Dept. of Aerospace Engineering, Cincinnati, Ohio).

Raumfahrtforschung, vol. 13, May-June 1969, p. 107-111. 6 refs.

Review of solar power technology and study of an idealized concentrator-absorber system. The flux distribution in the focal plane is derived, and the opening of the cavity is determined for the maximization of the absorbed energy. The maximum achievable temperature of the cavity is found. A numerical example is presented. (Author)

A69-35056

LARGE SOLAR ARRAYS - THE EMERGING SPACE POWER WORKHORSE.

J. E. Boretz, Sr. (TRW Systems Group, Redondo Beach, Calif.).
IN: SPACE, TECHNOLOGY, AND SOCIETY; CANAVERAL COUNCIL OF TECHNICAL SOCIETIES, SPACE CONGRESS, 6TH, COCOA BEACH, FLA., MARCH 17-19, 1969, PROCEEDINGS. VOLUME 2.

Edited by L. E. Jones, III.

Cape Canaveral, Fla., Canaveral Council of Technical Societies, 1969, p. 2-1 to 2-18. 16 refs.

Study of the technological problems associated with long-duration solar-array operations in space. The main emphasis is upon identifying the challenges confronting the solar array designer rather than providing specific solutions. Current technical approaches being taken are outlined, and their effectiveness in enhancing the technology readiness of solar array systems is discussed. The discussion is confined to a review of technological problems which are related to the performance and design of cell-stack, substrate, and related power distribution elements. V. P. M.

A69-35679

IMPURITY PHOTOVOLTAIC EFFECT IN SILICON.

G. Güttler and H. J. Queisser (Frankfurt, Universität, Physikalisches Institut, Frankfurt am Main, West Germany).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PHOTOVOLTAIC SPECIALISTS CONFERENCE, 7TH, PASADENA, CALIF., NOVEMBER 19-21, 1968, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 1-8. 15 refs.

Impurity photovoltaic effect of the gold donor level in silicon has been observed. The spectral response of the open circuit voltage was measured with a lock-in technique. The optical cross section for the transition from that level to the conduction band was determined. Generalization to any deep center was made in view of solar cell performance. It is concluded that no improvement of solar cell efficiency can be achieved by doping with deep traps, because the additional utilization of low-energy photons is overcompensated by an enhanced minority carrier recombination. (Author)

A69-35691 *

CHARACTERISTICS OF SOLAR CELLS AT LOW TEMPERATURES.

Robert J. Lambert (U.S. Navy, Office of Naval Research, Naval Research Laboratory, Washington, D.C.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PHOTOVOLTAIC SPECIALISTS CONFERENCE, 7TH,

02 SOLAR ENERGY

PASADENA, CALIF., NOVEMBER 19-21, 1968, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 97-100.

NASA-supported research.

Study of a group of solar cells comprising 1 ohm-cm p/n, 1 ohm-cm n/p, and 10 ohm-cm n/p types, at temperatures from 82 to 300 deg K and at light intensities from approximately 1 to 140 mW/sq cm. Efficiencies increased as temperature decreased from 300 to 85 deg K, except at low intensity. Cell efficiency at low temperatures is at least equal to that measured at 300 deg K. Increases up to 73.6% are observed, with efficiencies of 16.1% measured at 140 mW/sq cm and 85 deg K. (Author)

A69-35707

LARGE SOLAR ARRAY DEVELOPMENT IN U.K.

F.C. Treble (Ministry of Technology, Royal Aircraft Establishment, Farnborough, Hants., England).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PHOTOVOLTAIC SPECIALISTS CONFERENCE, 7TH, PASADENA, CALIF., NOVEMBER 19-21, 1968, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 226-233. 6 refs.

Aspects of large solar array technology, with particular reference to the development of an experimental 560-W deployable array, which has some novel features. The array consists of very thin silicon solar cells mounted on Kapton polyimide film. It is stowed by folding the Kapton concertina-fashion into rectangular compartments and deployed by pneumatically actuated telescopic masts. Deployment is initiated by duplicated pyrotechnic actuators and takes about two minutes to complete. The estimated all-up weight of the 78-sq ft array (including stowage compartments, cushioning, and deployment mechanism) is 25.2 lb, giving a power/weight ratio of 22.3 W/lb at 55 deg C. The main problem areas are discussed in some detail, with an indication of the progress made to date. (Author)

A69-35708

SOLAR ARRAYS UTILIZING LARGE AREA SILICON SOLAR CELLS.

J. D. Gum, E. D. Steele, R. L. Oliver, and E. L. Ralph (Textron, Inc., Sylmar, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PHOTOVOLTAIC SPECIALISTS CONFERENCE, 7TH, PASADENA, CALIF., NOVEMBER 19-21, 1968, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 234-242.

When production of large-area silicon solar cells appeared practical, an investigation was initiated into their characteristics to develop systems and techniques allowing utilization of their special qualities. One hundred thousand cells later, the results show comparable reliability to 2 x 2 cm cell arrays but with lower costs. Effects of thermally caused differential dimensional changes can be minimized or eliminated through proper design. Where panel sizes permit, large-area cells provide advantages. (Author)

A69-35709

ELECTRICAL OUTPUT OF SHADOWED SOLAR ARRAYS.

H. S. Rauschenbach (TRW Systems Group, Redondo Beach, Calif.).

IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, PHOTOVOLTAIC SPECIALISTS CONFERENCE, 7TH, PASADENA, CALIF., NOVEMBER 19-21, 1968, CONFERENCE RECORD.

New York, Institute of Electrical and Electronics Engineers, Inc., 1968, p. 243-252. 15 refs.

The effects of shadows on the current-voltage characteristics of solar cell circuits are studied and used for the development of several mathematical models. These models describe circuits of any

geometry with or without shunt or blocking diodes. For efficient analyses of larger arrays, the concept of the shadowing factor is developed. All models are useful in analyses performed by hand or digital computer, using theoretical or empirical input data. (Author)

A69-36418 * #

STATUS OF PHOTOVOLTAIC POWER TECHNOLOGY.

Arvin Smith (NASA, Washington, D.C.).

(American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Dec. 1-5, 1968, Paper 68-WA/Sol-1.)

ASME, Transactions, Series A—Journal of Engineering for Power, vol. 91, Jan. 1969, p. 1-12. 77 refs.

Review of the status of photovoltaic power technology primarily from the viewpoint of current and future applications to the exploration and use of space. The photovoltaic-solar cell technology has shown steady improvement in reliability, increased efficiency, reduced cost, increased power per unit of hardware weight, and ability to withstand extremes of the space environment. New developments are underway to increase solar-cell and array size, to reduce stowage volume during boosting into orbit, and to improve resistance to space radiation and thermal cycling. Silicon-cell electrical contacts and interconnections, low-energy proton damage to small exposed cell areas, and instability of CdS thin-film solar cells are examples of problems receiving attention at this time.

M. M.

A69-42271

A TECHNIQUE FOR IDENTIFYING THE CAUSE OF PERFORMANCE DEGRADATION IN CADMIUM SULFIDE SOLAR CELLS.

K. L. Kennerud (Boeing Co., Seattle, Wash.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p. 561-566.

Calculation of the effect of changes in five physically meaningful parameters on the current-voltage curve of a CdS solar cell. Comparisons between the calculated data and performance data obtained from degraded solar cells are made. The parameter that changed to cause the degradation in each cell becomes apparent.

(Author)

A69-42273

THE "HOT SPOT" FAILURE MODE FOR SOLAR ARRAYS.

F. A. Blake and K. L. Hanson (General Electric Co., Valley Forge Space Center, Philadelphia, Pa.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p. 575-581.

Description of the "hot spot" phenomenon, and evaluation of the results of investigations on the amount of heating and temperature rise that are expected in solar arrays. It is pointed out that the potentially destructive "hot spot" phenomenon is due to a small fault in a solar array series element. The fault produces a perfor-

mance anomaly which switches the element from a power generator to a power dissipator in which all of the functioning illuminated cells within the element overheat. The severity of the heating is dependent on solar array operating conditions and design configuration. The most effective protection against this failure mode is to produce control of the I-V characteristic performance in the negative-voltage quadrant through use of bypass diodes. Z.W.

A70-10750

SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum (Akademiia Nauk Turkmenskoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR). (Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikovakh*, Moscow, Izdatel'stvo Nauka, 1968.) New York, Consultants Bureau, 1969. 229 p. \$27.50.

CONTENTS:

PREFACE TO THE AMERICAN EDITION. V. A. Baum (Akademiia Nauk Turkmenskoi SSR, Ashkhabad, Turkmen SSR), p. v, vi.

PREFACE. V. A. Baum (Akademiia Nauk Turkmenskoi SSR, Ashkhabad, Turkmen SSR), p. vii, viii.

DESIGN AND TEST METHODS FOR SEMICONDUCTOR GENERATORS.

EXPERIMENTAL SOLAR THERMOELECTRIC GENERATOR. G. A. Alatyrtsev, V. A. Baum, Iu. N. Malevskii, and N. G. Milevskaia (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 3-8.

POWER CHARACTERISTICS OF A SOLAR THERMOELECTRIC GENERATOR. M. Gaibnazarov, Iu. N. Malevskii, and I. A. Rezgol' (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 9-14. 5 refs.

INFLUENCE OF A LINEAR DISTRIBUTION OF HEAT FLUX ON THE EFFICIENCY OF A THERMOELECTRIC GENERATOR. Iu. N. Malevskii and N. G. Milevskaia (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 15-22.

CASCADED THERMOELEMENTS AND METHODS OF THEIR DESIGN. M. Gaibnazarov and Iu. N. Malevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 23-29. 19 refs.

CHARACTERISTICS AND POSSIBLE APPLICATIONS OF THERMIONIC SOLAR POWER SOURCES. I. M. Rubanovich (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 30-36.

TESTS ON A PHOTOELECTRIC SOLAR UNIT FOR PUMPING WATER. B. V. Tarnizhevskii and B. Ia. Rodichev (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 37-41.

CONTROL SYSTEM FOR A PHOTOELECTRIC SOLAR WATER-PUMPING UNIT. L. F. Shul'meister, G. V. Elevich, A. V. Egorov, and B. V. Tarnizhevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 42-45.

PROPERTIES OF SEMICONDUCTING MATERIALS.

GERMANIUM TELLURIDE AS A THERMOELECTRIC MATERIAL. R. Kh. Baranova, Iu. N. Malevskii, and N. F. Sapizhenko (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 49-54. 10 refs.

INFLUENCE OF HIGH-ENERGY GAMMA RADIATION ON THE THERMOELECTRIC PROPERTIES OF PbSe AND GeTe ALLOYS. R. Kh. Baranova and L. I. Slokhotoy (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 55-57.

USE OF ELECTROPLATING IN THE BRIDGING OF THERMOELEMENTS. G. A. Alatyrtsev, G. T. Eidinova, and Iu. N. Malevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 58-61. 5 refs.

SOME BRIDGING SOLDERES FOR THERMOELEMENTS OPERATING AT MODERATE TEMPERATURES. G. A. Alatyrtsev, Iu. N. Malevskii, and G. T. Eidinova (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 62-64. 6 refs.

VARIATIONAL METHODS FOR EXPERIMENTAL INVESTIGATIONS OF THE THERMAL AND ELECTRICAL PROPERTIES OF SEMICONDUCTING MATERIALS. I. S. Lisker (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 65-82. 15 refs.

APPARATUS FOR THE DETERMINATION OF THE THERMAL AND ELECTRICAL PROPERTIES OF SEMICONDUCTORS. I. S. Lisker (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 83-97.

CONCENTRATION OF SOLAR RADIATION AND THERMAL CONDITIONS IN CONVERTERS.

MIRROR-AND-LENS SOLAR ENERGY CONCENTRATOR. R. R. Aparisi, Ia. G. Kolos, and N. I. Shatov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 101-110. 5 refs.

OPTICO-MECHANICAL SECTION OF A THERMOELECTRIC SOLAR WATER-PUMPING UNIT. L. N. Vladimirova and B. A. Garf (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 111-117.

CALORIMETRIC INVESTIGATION OF A SOLAR RADIATION CONCENTRATOR FOR A THERMOELECTRIC WATER-PUMPING UNIT. D. I. Tepliakov, R. R. Aparisi, Ia. G. Kolos, R. A. Zakhidov, and A. Annaev (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 118-133.

THERMAL CONDITIONS IN CYLINDRICAL CAVITY ABSORBERS OF HIGH-TEMPERATURE SOLAR ENERGY CONVERTERS. R. A. Zakhidov and D. I. Tepliakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 134-142. 11 refs.

TRANSPORT AND DISTRIBUTION OF RADIATION IN SOLAR ENERGY UNITS WITH MIRROR CONCENTRATORS. D. I. Tepliakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 143-166. 35 refs.

ENERGY CHARACTERISTICS OF SOLAR UNITS WITH MIRRORS UNDER SERVICE CONDITIONS. D. I. Tepliakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 167-182. 18 refs.

INVESTIGATIONS OF HIGH-TEMPERATURE SOLAR ENERGY ABSORBERS AND THERMAL STORAGE DEVICES. V. I. Baranov, G. F. Muchnik, and S. N. Trushevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 183-189. 9 refs.

OPTICAL ELEMENTS OF SOLAR CONVERTER UNITS.

OPTICAL INVESTIGATIONS IN SOLAR ENERGY ENGINEERING. A. V. Sheklein and N. B. Rekant (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 193-199. 18 refs.

SELECTIVE FILMS ON GLASS AND THEIR PROPERTIES. N. B. Rekant and A. V. Sheklein (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 200-208. 9 refs.

APPLICATIONS OF SELECTIVE COATINGS IN SOLAR THERMOELECTRIC GENERATORS. L. N. Vladimirova, B. A. Garf, and A. V. Sheklein (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 209-215. 12 refs.

REFLECTION REDUCTION, TEMPERATURE STABILIZATION, AND RADIATION PROTECTION OF SILICON PHOTOCELLS BY OPTICAL FILMS. M. M. Koltun and A. P. Landsman (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR), p. 216-222. 9 refs.

02 SOLAR ENERGY

A70-10751

EXPERIMENTAL SOLAR THERMOELECTRIC GENERATOR.

G. A. Alatyrtsev, V. A. Baum, Iu. N. Malevskii, and N. G. Milevskaya (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 3-8.

Description of a semiconductor thermoelectric generator with a structure which facilitates the replacement of faulty thermoelements during service. The generator, which is convenient to assemble, consists of 25 series-connected thermoelements whose arms have a total cross-sectional area of 39 sq cm. The thermoelements are made from p- and n-type alloys based on selenium and lead. The generator is designed to operate in the temperature range from 50 to 450 deg C. The upper temperature level is selected on the basis of the stability of the working material in air for an acceptable value of the product zT (0.5 to 0.6). Diffused joints are used between the metal straps and the semiconductors. Tests using natural (solar) radiation were carried out with a paraboloid concentrator of 1.4-m diameter. The temperature distribution over the surface of the hot junctions placed in the focal plane of the concentrator, the output power, and the efficiency of the generator were determined. (Author)

A70-10752

POWER CHARACTERISTICS OF A SOLAR THERMOELECTRIC GENERATOR.

M. Gaibnazarov, Iu. N. Malevskii, and I. A. Rezgl' (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 9-14. 5 refs.

Theoretical analysis of the output parameters of a cascaded solar thermoelectric generator (STEG). The conditions for maximum efficiency of a STEG are considered, and a method is suggested for the determination of the optimum temperature of the hot junctions of the thermoelements as a function of the concentration of solar radiation. The current-voltage characteristic of a STEG is analyzed for a constant heat flux from a source. Calculations show that, within the limits of the load characteristic of a STEG, a change in the temperature of the hot junction gives rise to a considerable nonlinearity in the current-voltage characteristic. The value of the voltage across the load, corresponding to the maximum output power and efficiency, is less than half the open-circuit voltage. (Author)

A70-10761

THERMAL CONDITIONS IN CYLINDRICAL CAVITY ABSORBERS OF HIGH-TEMPERATURE SOLAR ENERGY CONVERTERS.

R. A. Zakhidov and D. I. Teplakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 134-142. 11 refs.

Study of the problem of the optimization of the geometry of cavity absorbers from the point of view of the absorption parameters of the radiation (density level and nature of the distribution along wall surfaces) reflected by a concentrator. The problem of the optimization of the geometry is related to the thermal conditions in the absorber—i.e., to the possibility of heat transfer by conduction along the walls. An analysis based on certain assumptions about the

structure of the radiation field and on the results of specially conducted experiments shows that, to obtain optimum average intensities of the radiation incident along the bottom and side walls of a cylindrical absorber, the optimum ratio should be $l/d \approx 1$ (l is the depth and d is the diameter of the absorber). The distribution of the local radiant flux incident on various parts of an absorber is investigated. (Author)

A70-10762

TRANSPORT AND DISTRIBUTION OF RADIATION IN SOLAR ENERGY UNITS WITH MIRROR CONCENTRATORS.

D. I. Teplakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 143-166. 35 refs.

Review and analysis of several theoretical solutions for the concentration of direct solar radiation by paraboloid mirrors. It is shown that complete allowance for mirror imperfections can be made using equivalent but different methods of solution, based on the assumption that the imperfections of the reflecting surfaces of solar energy concentrators are distributed statistically (at random). Energy transport and distribution functions in the concentration field of radiant energy are introduced and commented on. A generalized system for measuring coordinates, radiant fluxes, and radiation density is discussed. The limits of validity of ideal (simplified) methods are established. (Author)

A70-10763

ENERGY CHARACTERISTICS OF SOLAR UNITS WITH MIRRORS UNDER SERVICE CONDITIONS.

D. I. Teplakov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 167-182. 18 refs.

Consideration of the influence of inaccurate positioning of an absorber in a concentrating solar-unit mirror on the energy parameters of the unit. Transverse defocusing, consisting of a shift of a circular absorber along the focal plane of a mirror concentrator, is considered. Longitudinal defocusing, which represents a shift of the absorber along the optical axis, and defocusing due to angular misalignment, with the absorber positioned at an angle to the focal plane, are also discussed. The energy parameters of units with complex (composite) optical systems, including one or more heliostats, are analyzed. The results, obtained by computer calculations, are presented graphically in a generalized system for measuring coordinates, radiant fluxes, and their densities, so that they can be applied to mirrors of various dimensions and arbitrary quality. (Author)

A70-10764

INVESTIGATIONS OF HIGH-TEMPERATURE SOLAR ENERGY ABSORBERS AND THERMAL STORAGE DEVICES.

V. I. Baranov, G. F. Muchnik, and S. N. Trushevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of *Preobrazovatel'i Solnechnoi Energii na Poluprovodnikakh*, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 183-189. 9 refs.

Results of theoretical and experimental investigations of solar-energy absorbers and thermal storage devices intended for use in high-temperature converters of solar energy into electrical power by thermionic or thermoelectric methods. Experiments were carried out on absorbers in the form of a hemisphere, sphere, and cylinder, using solar radiation and a laboratory light source imitating solar radiation. The possibility of constructing absorbers with an even temperature distribution along the walls is considered. The thermal storage devices described operate on the principle of the use of the latent heat of phase transitions Q_{ph} . A mathematical statement of the problem is given, together with the results of calculations (carried out using an electronic computer) of the thermal and geometrical parameters of thermal storage devices. Chemical and thermal storage devices are compared. Thermal storage materials with Q_{ph} equal to 150 J/kg have been found, and attempts are being made to increase this value. (Author)

A70-10767

APPLICATIONS OF SELECTIVE COATINGS IN SOLAR THERMOELECTRIC GENERATORS.

L. N. Vladimirova, B. A. Garf, and A. V. Sheklein (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR). IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of Preobrazovateli Solnechnoi Energii na Poluprovodnikakh, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 209-215. 12 refs.

Description of a method for making thermal calculations of solar energy units of the "hot box" type with an ordinary glass insulation and with selective glasses which reflect strongly the long-wavelength radiation of a hot absorber. Results are given of a comparative analysis, showing that the use of selective glasses is to be recommended, particularly at the elevated temperatures of an absorber (80 deg C or higher). Such glasses can be recommended for solar thermoelectric generators working without solar radiation concentrators. It is shown that at relatively low temperatures, such as those used in heating water for shower baths, the use of selective glass is not justified, since in this case the radiant heat losses are relatively low and their reduction by selective insulation results in a reduction of transmission of the short-wavelength radiation through the insulation. (Author)

A70-11932 * #

DEPLOYMENT TECHNIQUES DEVELOPED FOR LARGE AREA ROLL-OUT SOLAR ARRAYS.

W. A. Hasbach (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

IN: AEROSPACE STRUCTURES DESIGN CONFERENCE, SEATTLE, WASH., AUGUST 4, 5, 1969, PROCEEDINGS.

Conference sponsored by the Seattle Professional Engineering Employees Association, the American Institute of Aeronautics and Astronautics, the Boeing Co., the University of Washington, and the Pacific Science Center.

Seattle, Wash., Seattle Professional Engineering Employees Association, 1969, p. 1-1 to 1-12.

Description of a feasibility study which has been performed to determine deployment systems which could extend large-area, lightweight, flexible solar arrays in space. The estimated weight for each design concept, including the estimated power-to-weight ratio, is tabulated. In the stowed configuration, the array must occupy a minimum of area within the shroud envelope and, upon command, extend at a uniform rate into the deployed position. The manufacturing technology is limited to modest extensions of the existing state of development. M.M.

A70-12080

NEW METHODS FOR THE FABRICATION OF SOLAR ARRAYS (NEUE TECHNOLOGISCHE VERFAHREN FÜR SOLARZELLEN-ANLAGEN).

E. Suppa, J. Heinecke, F. Köhler, and E. Müller (Messerschmitt-Bölkow-Blohm GmbH, Munich, West Germany).

Raumfahrtforschung, vol. 13, Sept.-Oct. 1969, p. 205-212. 10 refs. In German.

Research supported by the Bundesministerium für Wissenschaftliche Forschung.

Description of some new advanced methods for the fabrication of solar arrays, which make it possible to extend the operating temperature up to 200 deg C by the use of spot welding techniques and the deletion of adhesives. Various problems associated with the solar array construction are reviewed, and new possibilities in the fabrication of modules are demonstrated. They include primarily a new pulsed welding technique which allows overall improvements in reliability, weight, and cost, as well as the use of silicon cells in flexible roll-out and fold-out arrays. O.H.

A70-15329

ANALYSIS OF PERFORMANCE DEGRADATION IN CdS SOLAR CELLS.

Kenneth L. Kennerud (Boeing Co., Aerospace Systems Div., Seattle, Wash.).

(AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS, p. 561-566.)

IEEE Transactions on Aerospace and Electronic Systems, vol. AES-5, Nov. 1969, p. 912-917.

Calculation of the effect of changes in five physically meaningful parameters on the current-voltage curve of a CdS solar cell. Comparisons between the calculated data and performance data obtained from degraded solar cells are made. The parameter that changed to cause the degradation in each cell becomes apparent. (Author)

A70-16724

NEW DEVELOPMENTS IN THE FIELD OF SOLAR CELLS (NEUERUNGEN AUF DEM GEBIET DER SOLARZELLEN).

Internationale Elektronische Rundschau, vol. 23, Dec. 1969, p. 319, 320. In German.

Discussion of a new improved solar cell developed to overcome the limitations of the present standard solar cell when subjected to extreme temperature fluctuations. The dimensions of the new cell, called the Telesun solar cell, are 6 by 2 by 0.014 cm. The new cells are well-suited for the construction of solar cell generators. Experiments leading to the development of improved contacts, including the wraparound contact, are discussed. G.R.

A70-16623 #

EMPIRICAL EQUATION FOR THE EXTERNAL CHARACTERISTIC OF A PHOTOELECTRIC SOLAR GENERATOR (EMPIRICHESKOE VYRAZHENIE DLIYA VNESHNEI KHARAKTERISTIKI SOLNECHNOGO FOTOELEKTRICHESKOGO GENERATORA).

A. T. Belenov, K. E. Koshkin, and B. V. Tarnizhevskii.

Geliotekhnika, no. 5, 1969, p. 6-10. In Russian.

Derivation of an empirical equation determining the external current-voltage characteristic of a composite multicell solar energy converter generating a power of 0.2 to 0.5 kW. This characteristic is a parameter of the entire composite system and is defined as a certain function of the combination of the current-voltage characteristics of the individual components cells of the converter. Fair agreement is obtained between current-voltage characteristics calculated with the aid of this equation and experimental characteristics, for two different geographical locations. V.Z.

A70-16625 #

MECHANICAL TREATMENT OF THE COLLECTOR SURFACES OF SOLAR INSTALLATIONS FOR IMPROVING THE SELECTIVITY OF OPTICAL PROPERTIES (MEKHANICHESKAIA OBRABOTKA KOLLEKTORNYKH POVERKHNOSTEI GELIOU-

02 SOLAR ENERGY

STANOVOK DLIYA POLUCHENIYA POVYSHENNOI SELEKTIV-NOSTI OPTICHESKIKH SVOISTV).

M. D. Kudriashova (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR). *Geliotekhnika*, no. 5, 1969, p. 36-39. 7 refs. In Russian.

Investigation of the possibility of improving the selectivity of the optical properties of solar installations by mechanical treatment of their light-collecting surfaces before coating. Grinding of copper and Duralumin plates with a variety of finely-divided abrasive powders is carried out to obtain desirable diffusely reflecting surfaces. A brand of diamond powder with 1 μ particles is found to provide the best results on Duralumin while a dry abrasive with 7 μ particles was most effective on copper. V.Z.

A70-21721 Calculated efficiencies of practical GaAs and Si solar cells including the effect of built-in electric fields. B. Ellis and T. S. Möss (Royal Aircraft Establishment, Farnborough, Hants., England). *Solid-State Electronics*, vol. 13, Jan. 1970, p. 1-24. 28 refs.

The performance of GaAs solar cells has been calculated as a function of the doping levels, using practical values for the transport parameters. Calculations show that surface recombination is a more probable cause than recombination in the junction region of the poor efficiencies obtained in practice. Electric fields built into the cell by doping gradations may be used to reduce surface losses and produce an efficiency exceeding 20 per cent for a surface recombination velocity of 10 km/sec. This figure allows for the finite resistance of the surface layer, the effect of which is considered in detail for several cases. Results for Si cells are also presented. These are well in accord with the values obtained in practice. For both materials consideration is given to the degradation brought about by particle bombardment. (Author)

A70-22050 Solar cells. M. W. Ranney, Park Ridge, N.J., Noyes Development Corp., 1969. 285 p. \$35.

The detailed, descriptive information in this book is based on U.S. patents relating to solar cells. The book serves a double purpose in that it supplies detailed technical information, and can be used as a guide to the U.S. Patent literature in this field. Silicon semiconductors are considered taking into account silicon-metal alloys. Cell panel fabrication techniques are discussed and progress made concerning semiconductors using cadmium or gallium compounds is examined. Advances in the use of organic semiconductors and in the use of photoemissive devices for solar cell application are included. Some miscellaneous applications are discussed relating to position detection in space and to control requirements for plant growth regulation. G.R.

A70-23522 * # Optics at the Lewis Research Center. D. R. Buchele (NASA, Lewis Research Center, Cleveland, Ohio). *Applied Optics*, vol. 9, Feb. 1970, p. 399-403. 71 refs.

A survey is presented of the applications of optics to research at the NASA Lewis Research Center. The Center's principal research areas are flight propulsion and space power generation; these use optical devices and techniques in photography, gas density visualization, pyrometry of gases and surfaces, radiative heat transfer studies, spectroscopy, spectroradiometry, solar simulation, and solar-cell development for space applications. (Author)

A70-25434 # Oriented flexible rolled-up solar array. George Wolff (Hughes Aircraft Co., Space Systems Div., Culver City, Calif.). *American Institute of Aeronautics and Astronautics, Communications Satellite Systems Conference, 3rd, Los Angeles, Calif., Apr. 6-8, 1970, Paper 70-738*. 11 p. Members, \$1.00; nonmembers, \$1.50.

This paper describes the operation of and the components of the large oriented flexible rolled-up solar array as well as advances in subcomponent technology. The components described are the orientation mechanism, solar panel, and deployment mechanism. (Author)

A70-29554 Solar generators and solar cells (Solar-generatoren und Solarzellen). Hans-Walter Boller, Rolf Buhs, Hans-Joachim Dürre, and Günter Mohns. *AEG-Telefunken, Technische Mitteilungen*, vol. 60, no. 2, 1970, p. 85, 86. In German.

Discussion of the principal requirements posed to solar cells and solar cell array, as a function of the illumination conditions, the satellite orbit, and the geometry and type of stabilization of the satellite. In addition, cells and arrays must be designed for high accelerations, vibration, mechanical shock, and for the influence of vacuum, extreme temperatures, extreme and rapid temperature variations, UV and corpuscular radiation, and micrometeorite impact. Some solutions obtained for several satellite projects are noted. V.P.

A70-30907 High temperature phase studies with a solar furnace. Tetsuo Noguchi (Government Industrial Research Institute, Nagoya, Japan). In: *Advances in high temperature chemistry*. Volume 2. Edited by LeRoy Eyring. New York, Academic Press, Inc., 1969, p. 235-262. 65 refs.

Review of the state of art concerning high temperature studies on solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using a solar furnace. The optical system, structure and types of solar furnaces are described together with irradiation techniques and attainable temperatures. The methods used for temperature and emissivity measurements are reviewed. The freezing points of the high-melting point refractory oxides were determined. Special attention is given to the phase studies at high temperatures including determination of the liquidus curves, high temperature reactions, vaporization and rate studies, and determination of phase diagrams of high-melting point oxides. Z.W.

A70-31600 # Biological problems of solar energy conversion (Biologicheskie problemy preobrazovaniia solnechnoi energii). A. A. Shakhov (Akademiia Nauk SSSR, Institut Fiziologii Rastenii, Moscow, USSR). (*Vsesoiuznaia Konferentsiia po Ispol'zovaniiu Solnechnoi Energii, Yerevan, Armenian SSR, July 19, 1969.*) *Geliotekhnika*, no. 6, 1969, p. 41-54. 30 refs. In Russian.

Survey of the current state of knowledge about photosynthesis and nonphotosynthesis mechanisms of biological conversion of solar energy. The three stages of photosynthesis are examined; these include (1) the separation of hydrogen from the water molecule and the liberation of oxygen, (2) transfer of hydrogen with the aid of energy trapped by chlorophyll, and (3) use of the oxygen to reduce carbon dioxide to carbon. The nonphotosynthesis conversion process is relatively lightly studied, but it is reliably known that it is partially caused by free-radical processes. Data available in the literature are analyzed, and attention is given to artificially created photochemical conversion systems. T.M.

A70-32424 # Measurements of temperatures of products treated in a solar furnace by means of IR pyrometers (Mesure des températures des produits traités au four solaire à l'aide de pyromètres infra rouge). M. Foex, J. P. Coutures, and G. Benezech. (*Coopération Méditerranéenne pour l'Energie Solaire, Rencontre Générale, Athens, Greece, Sept. 8-13, 1969.*) *Coopération Méditerranéenne pour l'Energie Solaire, Bulletin* no. 18, Apr. 1970, p. 67-77. 18 refs. In French.

Study of the advantages and drawbacks concerning the use of IR pyrometers for measuring temperatures of products treated in a solar furnace. It is shown that by employing certain interference filters, the temperatures ranging from 2000 to 3500 deg C can be measured by means of optical pyrometers if the parasitic effects due to reflections of the solar radiation are eliminated. Problems concerning the determination of radiation factors when the black body can not be used are discussed. Z.W.

A70-32425 # Feasible energy and technical characteristics of solar thermoelectric generator (STEG) with two-stage converter. V. A. Baum, M. Gaibnazarov, and Iu. N. Malevsky. (*Coopération*

Méditerranéenne pour l'Energie Solaire, Rencontre Générale, Athens, Greece, Sept. 8-13, 1969.) Coopération Méditerranéenne pour l'Energie Solaire, Bulletin no. 18, Apr. 1970, p. 115-122. 9 refs.

Survey of the theoretical and practical developments concerning the solar thermoelectric converter with two-stage circuit. It is pointed out that the main factor which determines the efficiency of a thermoelectric converter is the heat flux on the surface of hot junction. Use of modern semiconductor materials makes it possible to develop a converter having the weight characteristics of the order of 10 kg/kW. The efficiency actually obtained under laboratory conditions at about 900 deg K attains 11% when a two stage circuit is used. Higher concentrations of the radiant flux make it possible to improve the characteristics of this converter and reduce the required frontal area of the concentrator. Z.W.

A70-34131 * # Thermal Heliotrope - A passive sun-tracker. R. C. Byxbee and D. R. Lott (Lockheed Missiles and Space Co., Sunnyvale, Calif.). In: Aerospace mechanisms. Part A - General applications. Edited by G. G. Herzl. San Francisco, J. W. Stacey, Inc. (Aerospace Mechanisms Series. Volume 1), 1970, p. 283-289. 9 refs. Contract No. NAS 5-11637.

Because of the high cost and mechanical problems associated with large fixed solar arrays, sun tracking is of special interest to aerospace engineers. Moreover, since conventional electromechanical tracking systems have proved to be complicated and expensive, a passive approach is desirable. By utilizing solar energy to activate a bimetal helix, a passive Thermal Heliotrope is possible. This concept has been used successfully for louvers and thermal switches in thermal control. Initial model tests have proved the heliotrope concept, and development work is being performed to establish feasibility. Three types of Thermal Heliotrope are discussed: a reset tracker, an incremental tracker, and a seasonal adjuster. (Author)

A70-36238 # Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide (Geterogennyye solnechnyye preobrazovateli na osnove polikristallicheskogo sul'fida i selenida kadmiia). V. N. Komashchenko, A. I. Marchenko, and G. A. Fedorus (Akademiia Nauk Ukrainskoi SSR, Institut Poluprovodnikov, Kiev, Ukrainian SSR). *Poluprovodnikovaia Tekhnika i Mikroelektronika*, no. 4, 1970, p. 112-121. 11 refs. In Russian.

Discussion of the characteristics of photocells developed on the basis of cadmium sulfide and selenide. The preparation methods are described, along with the photoelectric and electric properties of these devices. It is shown that they possess a high photosensitivity throughout the visible range of the spectrum. The efficiency of conversion of light to electric energy is about 3%. These photocells exhibit a high parameter stability in time. M.V.E.

A70-40623 * Heterojunction solar cell calculations. R. Sahai and A. G. Milnes (Carnegie-Mellon University, Pittsburgh, Pa.). *Solid-State Electronics*, vol. 13, Sept. 1970, p. 1289-1299. 12 refs. Grant No. NGR-39-087-002.

Solar cell efficiencies are computed for feasible semiconductor heterojunction cells of ZnSe-GaAs, GaP-Si, ZnSe-Ge, and GaAs-Ge. The analysis includes the loss in efficiency because of reflection, incomplete collection and internal series resistance. Optimum anti-reflection films are also calculated. The results are compared with the performances expected of Si solar cells and GaAs homojunction cells. ZnSe-GaAs cells are shown to have the potential for exceeding the efficiency of both Si and GaAs cells, if interface recombination losses are small. The output voltage, voltage regulation and temperature performance should be superior to that of Si cells. The window effect in the heterojunction cell may also provide some inherent resistance to deterioration under radiation conditions. (Author)

A70-41008 How mechanical requirements affect silicon solar-cell costs. P. A. Iles and K. S. Ling (Globe-Union, Inc., El Monte, Calif.). In: Space systems and thermal technology for the

70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. New York, American Society of Mechanical Engineers, 1970. 4 p.

N/P solar cells of design presently being produced have been the workhorse for space power for the past six years. Several million cells have been flown and there has been a steady increase in average output per dollar and in cell reliability. The specifications used to select acceptable cells have become more demanding both in electrical output and environmental stability areas and in mechanical and visual requirements. This paper describes typical present-day specifications and discusses how cell costs could be reduced, with no loss of output or reliability, if some of the mechanical and visual requirements were relaxed. (Author)

A70-41010 * Solar-panel approaches for a Venus-Mercury flyby. Ronald G. Ross, Jr. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Space systems and thermal technology for the 70's; American Society of Mechanical Engineers, Space Technology and Heat Transfer Conference, Los Angeles, Calif., June 21-24, 1970, Proceedings. Part 1. New York, American Society of Mechanical Engineers, 1970. 8 p.

If Mercury is at its aphelion (0.43 AU) during encounter, a spacecraft designed to flyby Venus and Mercury will be subjected to solar intensities ranging from 1 to 5 times that at earth. Because flat, fully celled solar panels will exceed their maximum safe operating temperature at intensities greater than 2 or 3 suns, it is necessary to provide some additional means of temperature control. This paper describes the techniques used to evaluate the temperature and power performance of solar-array designs being considered for a 1973 Venus-Mercury mission. Also presented is a comparison of the predicted performances of three candidate designs: the mirror mosaic design, the selective bandpass filter design, and the tilted panel design. (Author)

A70-41852 # Heat-transfer processes in solar energy storage systems for orbital applications. Frank Matinek (Vermont, University, Burlington, Vt.). *Journal of Spacecraft and Rockets*, vol. 7, Sept. 1970, p. 1032-1037. 15 refs.

Study of the use of solar energy for power conversion systems for orbital missions, showing that by using heat storage systems utilizing the heat of fusion and the sensible heat of materials such as LiH it should be possible to store the energy collected during the orbital day and to release it during the orbital night. Two versions of such a storage system (a system involving change of phase and a system with fins) are proposed, and their schematic diagrams and mathematical models are examined. The behavior of a heat storage employing the heat of fusion is predicted. The feasibility of synchronizing the thermal cycle with the orbital time is demonstrated, and the limiting operating conditions are determined. V.P.

A70-43537 # New developments in degradation-resistant CdS solar cells. L. Clarke, R. Gale, K. Moore, R. J. Mytton, and R. S. Pinder (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England). *Joint Services Electrical Power Sources Committee, International Power Sources Symposium, 7th, Brighton, England, Sept. 15-17, 1970, Paper 38*. 12 p. 12 refs. Research sponsored by the Communications Satellite Corp.

Description of the construction, operation, attractive features and present limitations of CdS thin film solar cells. A description of cell manufacture is given as a background for consideration of the possible degradation mechanisms. Experiments to further characterize the individual mechanisms led to improvements in manufacturing technology to minimize the instabilities. The effect of the operating conditions of the cells on the amount of degradation is discussed. The prospects for CdS cells are reviewed in the light of improvements in stability achieved. M.M.

02 SOLAR ENERGY

A70-46325 # Semiconductor solar energy converters and the phenomenon of photoconductivity quenching (Poluprovodnikovye preobrazovateli solnechnoi energii i iavlenie gasheniia fotoprovodimosti). M. S. Isamukhamedova and P. M. Karageorgii-Alkalaev (Tashkentskii Gosudarstvennyi Universitet, Tashkent, Uzbek SSR). *Gefiotekhnika*, no. 3, 1970, p. 16-19. 6 refs. In Russian.

Theoretical study of the application of semiconductor materials in solar energy converters, with special attention to photoconductivity quenching which may occur when a semiconductor with a wide forbidden band is used for solar energy conversion. A semiconductor model with two impurity levels exchanging current carriers is analyzed to determine the conditions of the occurrence of photoconductivity quenching. Expressions describing this phenomenon are derived. An analysis of these expressions indicates that photoconductivity quenching tends to develop at high temperatures in semiconductors of this type. V.Z.

A71-11896 # Longwave sensitivity of nCdS-pCu(2-x)S solar converters (Dovgokhvil'ova chutivist' soniachnikh peretvoriuvachiv n-CdS - p-Cu(2-x)S). A. I. Marchenko, S. Iu. Pavelets', and G. A. Fedorus (Akademiia Nauk Ukrain'skoi RSR, Institut Napiivprodniukiv, Kiev, Ukrainian SSR). *Ukrains'kii Fizichnii Zhurnal*, vol. 15, Sept. 1970, p. 1529-1533. 7 refs. In Ukrainian.

Experimental investigation of the characteristics of photoconverters obtained on the basis of CdS films and having heterojunctions prepared by dipping the films for several seconds into an aqueous solution of CuCl heated to 100 C. Analysis of the spectral distribution of the absorption of Cu(2-x)S films and of the short-circuit photocurrent of the system CdS-Cu(2-x)S showed that the sensitivity of the photoconverters in the longwave region of the spectrum (0.5 to 1 micron) is essentially defined by extrinsic absorption of light in CdS. Extrinsic photo emf was observed only in CdS-based photoelements with a high-resistance surface layer. V.P.

A71-16058 Integrated high voltage cadmium sulphide solar batteries. R. J. Mytton, R. S. Pinder, and K. Moore (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 30-32.

A new type of integrated cadmium sulphide solar battery is described which obviates the need for a grid and which generates a high voltage from a single integrated unit. Several such batteries have been constructed, each consisting of seventeen cells formed and interconnected in series within one CdS film. The method of interconnection, involving Cu₂S channels within the CdS film, has been established, but further development is required to optimize the efficiency of these devices and realize their full potential. (Author)

A71-16071 * Low temperature and low solar intensity characteristics of silicon solar cells. Patricia A. Payne and Eugene L. Ralph (Textron, Inc., Sylmar, Calif.). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 135-141. Contract No. NAS 2-5519.

Demonstration that the efficiencies of N/P silicon solar cells at a solar intensity of 5.0 mW/sq cm and a temperature of -135 C have been greatly improved by forming a P(+) region on the back cell surface to eliminate a metal-semiconductor Schottky barrier at the rear contact. The 'broken knee' effect (a flat spot in the knee portion of an I-V curve) has been observed at low temperatures. It is observed primarily at low intensity; however, if serious enough, it is also present at high intensity. This effect acts like a leakage path which has a threshold voltage of 0.2 to 0.4 V and it seems to be associated primarily with the bar contact region of the solar cell. Cells fabricated from float zone and Mon-X silicon showed an improved linearity of the short circuit current as a function of

temperature over cells fabricated from crucible grown silicon. These cells consequently had higher short circuit currents at -135 C and, when the 'broken knee' was absent, exhibited efficiencies of 15 to 17%. (Author)

A71-16099 Progress in advanced solar array development. F. C. Treble (Royal Aircraft Establishment, Farnborough, Hants., England). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 319-325. 8 refs.

Review of progress in the development of a reliable, low-cost lightweight deployable array of silicon solar cells. The power-to-weight ratio of the 1-g design, which has some novel features, is 53 W/kg (24 W/lb). A series of 125-micron cells with wrap-around contacts is in pilot production following type approval. The cover slips are of a new cheap, radiation-resistant type. (Author)

A71-16100 * A concept for generating commercial electrical power from sunlight. William R. Cherry (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 331-337. 7 refs.

This paper proposes a method for reducing the critical electrical peak power shortage in the U.S. without adding further to the atmospheric and surface water pollution. Also, very small amounts of surface area are required and it will reduce the consumption of our earth's rapidly diminishing mineral resources. Our most abundant and limitless natural resource, solar energy, can provide over 250,000 kw of electrical power per square mile (equivalent to the NYC Indian Point Nuclear Plant) using today's solar cell technology. It is proposed to float a 'solar rug' on a helium mattress, between 50,000 and 70,000 feet, above the major cities in the U.S., well out of the weather and its disturbances, to supplement the peak power demands during the daylight hours. Calculations show that a square mile mattress 100 feet thick can support 10,000 tons at 53,000 feet elevation, sufficient to provide for a manned power station. While several aspects of the idea will require some major engineering development, a large proportion of this has already been done on a smaller scale in the space program and could be directly applied to solving some of our most critical terrestrial problems. (Author)

A71-16102 Increased output from silicon solar cells. P. A. Iles (Globe-Union, Inc., El Monte, Calif.). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 345-352.

Description of some advanced high-output silicon solar cells that have made it possible to raise the relatively long, fixed upper solar-cell output limit of 15.5 mW/sq cm to above 18 mW/sq cm. Their usefulness for space applications will depend on their performance at the expected radiation levels. In their favor is their wider range of design degrees of freedom. M.V.E.

A71-16103 Silicon solar cell technology of the seventies. R. Gereth, H. Fischer, E. Link, S. Mattes, and W. Pschunder (Telefunken AG, Heilbronn, West Germany). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 353-359. 16 refs.

Demonstration that the performance of Si solar cells has been improved by incorporating new technologies. Passivated Ti(Pd)Ag contacts together with a p(+) back contact guarantee a predictable

performance between -196 and +180 C. The cells survive storage at elevated temperatures or in humid atmosphere. A new wrap-around contact ensures maximum power output. A reactively evaporated TiO sub x film gives the best optical match between cell and cover glass. Gettered cells exhibit ultimate technological efficiency (e.g., 12% for a 300-micron, 10 ohm-cm, p-on-n cell) and a 20% increased power to weight ratio for 100-micron cells. (Author)

A71-16104 A new look at silicon solar cell performance. Martin Wolf (Pennsylvania, University, Philadelphia, Pa.). In: Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 8th, Seattle, Wash., August 4-6, 1970, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 360-371. 26 refs.

The loss mechanisms in present silicon solar cells have been reexamined and their impact on conversion efficiency in airmass zero and airmass one sunlight analyzed. Attention is focused on the process dependent losses which affect collection efficiency, voltage factor, and curve factor. The collection efficiency can be improved by 22% in the short wavelength region by reduction of surface recombination velocity and by increased minority carrier lifetime - combined with a drift field at the back contact in thin cells - in the long wavelength range. Voltage factor and curve factor yield 56% improvement by reduction of base region resistivity, while maintaining the minority carrier lifetime near present values. Accomplishment of these changes should yield conversion efficiency values near 20% in airmass zero sunlight. (Author)

A71-27432 * Highlights of a brushless direct-drive solar array control system design. L. J. Veillette (NASA, Goddard Space Flight Center, Space Power Technology Branch, Greenbelt, Md.). (Institute of Electrical and Electronics Engineers, Power Conditioning Specialists Conference, Greenbelt, Md., Apr. 20, 21, 1970.) IEEE Transactions on Aerospace and Electronic Systems, vol. AES-7, Mar. 1971, p. 324-328.

This paper summarizes a drive system design for controlling the position and rate of solar power arrays on orbiting spacecraft. There are no gears or sliding contact elements used anywhere in the system and only low-speed bearings are needed. Such mechanization is particularly well suited to solid lubrication techniques, and wear rates are very low, so that the drive system can operate directly in the space environment for long periods of time. Three major components were developed for implementation of this design concept. They are: (1) a brushless dc torque motor; (2) a rotary power transformer; and (3) an offset-tooth shaft position and rate sensor. These components are combined in a hybrid system configuration in which the signal processing and logic functions are performed by digital and linear integrated circuits. A root contour and describing function analysis, confirmed by experimentation, shows that several modes of limit cycle generation can occur in the vicinity of null. Compensation circuits are given that inhibit or suppress limit cycling and provide controlled electronic damping of the system. The system offers relatively high stiffness and can be operated at indefinitely low angular rates with minimum power consumption. (Author)

A71-28665 Power without pollution. Peter E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). *Journal of Microwave Power*, vol. 5, Dec. 1970, p. 211-222. 33 refs.

A concept for a satellite solar power station is described to meet future large scale electrical power requirements without burdening the environment or leading to natural resource exhaustion. Considerations are given to solar energy conversion, microwave generation and transmission, and conversion of microwave energy to electrical power on earth. The system considerations and the development tasks for a large satellite solar power station are reviewed and the potential technological needs are identified. (Author)

A71-28666 Microwave power transmission from an orbiting solar power station. G. Goubau (U.S. Army, Institute for Exploratory Research, Fort Monmouth, N.J.). *Journal of Microwave Power*, vol. 5, Dec. 1970, p. 223-231. 6 refs.

The paper considers the problem of microwave power transmission from an orbiting solar power station to the earth. In particular, questions such as the optimum frequency range, antenna dimensions and mechanical tolerances, phasing and directional control, and attainable transmission efficiencies are discussed. (Author)

A71-28668 High power microwave generators of the crossed-field type. William C. Brown (Raytheon Co., Waltham, Mass.). (International Microwave Power Institute, Symposium, 5th, The Hague, Netherlands, Oct. 7-9, 1970.) *Journal of Microwave Power*, vol. 5, Dec. 1970, p. 245-259. 8 refs.

The proposal to obtain electrical energy from the sun by means of an enormous solar cell array positioned in space at synchronous orbit altitude places a challenging requirement upon the means of converting this energy into microwave form so that it can be relayed to the earth's surface. Crossed-field device technology is consistent with the needs for high efficiency, long life, and for either modest or very high power levels in the dc to rf energy conversion process. A dc to rf energy conversion efficiency of 93% and an overall efficiency of 86% have been demonstrated in a high power magnetron. Continuous power over 400 kW at 3000 MHz and an efficiency of 76% have been obtained from the Amplitron, a crossed-field amplifier device. The development of a pure-metal, secondary emitter cathode provides long life capability. Newly developed permanent magnet material provides the high magnetic fields needed for high efficiency with low resulting weight. (Author)

A71-28669 High power linear beam tube devices. P. Guenard (Thomson - CSF, Orsay, Essonne, France). *Journal of Microwave Power*, vol. 5, Dec. 1970, p. 261-267. 7 refs.

As compared to high power tubes for satellite-borne communications transmitters, tubes for a space power station have no requirements on bandwidth and linearity characteristics. For this reason, the travelling wave tubes, which are interesting for communications because of their ability to transmit wide frequency bands, would very likely be discarded for power generation, because of their lower efficiency, which would require a rather complicated depressed collector. Among the various types of klystrons, the electrostatically focussed tube would bring the advantage of a lower weight, but this tube has to be improved to reach the efficiencies which have been demonstrated for magnetically focussed tubes. The discussion of a figure of merit in comparing various types of tubes for this particular application shows the importance, to reduce the overall weight, of operating the collector at as high a temperature as possible. This could be done with klystrons, where the heat dissipating electrode is well separated from the gun and the microwave structure. This high temperature operation of the heat radiators, together with a new technology based on an open structure and the extensive use of heat pipes should put the klystron in a good competitive position for the equipment of space power stations. (Author)

A71-28671 The receiving antenna and microwave power rectification. William C. Brown (Raytheon Co., Waltham, Mass.). (International Microwave Power Institute, Symposium, 5th, The Hague, Netherlands, Oct. 7-9, 1970.) *Journal of Microwave Power*, vol. 5, Dec. 1970, p. 279-292. 7 refs.

In a space power system the energy captured from the sun by means of a gigantic solar cell array is relayed to the earth by means of a microwave beam where the microwave energy is captured and converted into dc power. The capture and conversion processes can be jointly accomplished by a large nondirective aperture several square miles in area made from many small receiving apertures each terminated in an efficient solid-state rectifier. This kind of device,

02 SOLAR ENERGY

called a 'rectenna,' has achieved a combined collection and rectification efficiency of over 50% in the laboratory. An overall efficiency of 85% to 90% should be possible with additional development effort. A possible future direction of the evolution of this device for the space power station application is reviewed. (Author)

A71-29702 A new look at silicon solar cell performance. M. Wolf (Pennsylvania, University, Philadelphia, Pa.). *Energy Conversion*, vol. 11, June 1971, p. 63-73. 26 refs.

The loss mechanisms in present silicon solar cells are reexamined and their impact on conversion efficiency in airmass zero and airmass one sunlight are analyzed. Special attention is given to the process-dependent losses which affect collection efficiency, voltage factor, and curve factor. The collection efficiency can be improved by 22% in the short wavelength region by reduction of surface recombination velocity and by increased minority carrier lifetime - combined with a drift field at the back contact in thin cells - in the long wavelength range. Voltage factor and curve factor yield 56% improvement by reduction of base region resistivity, while maintaining the minority carrier lifetime near present values. Accomplishment of these changes should yield conversion efficiency values near 20% in airmass zero sunlight. Z.W.

A71-31671 # Calculation and cost optimization for some parameters of solar generator thermobatteries (K raschetu i optimizatsii po stoimosti nekotorykh parametrov termobatarei solnechnykh generatorov). L. M. Drabkin (Tashkentskii Institut Inzhenerov Zheleznodorozhnogo Transporta, Tashkent, Uzbek SSR). *Geliotekhnika*, no. 1, 1971, p. 9-15. In Russian.

Discussion of production cost optimization for solar power plants by properly selecting the heat carrier temperature, the contact-packet thermal resistance, the thermophysical parameters of the materials, and the fabrication technology for component batteries. Expressions are given for a profitable combination of design features of a solar power plant. Diagrams are plotted for fabrication cost per 1 W thermoelectric power. V.Z.

A71-31672 # Performance reliability calculation for a solar thermoelectric generator module (K voprosu rascheta nadezhnosti raboty modul'nogo solnechnogo termoelektrogeneratora). Iu. N. Malevskii and A. I. Tsvetkov (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR). *Geliotekhnika*, no. 1, 1971, p. 16-20. 6 refs. In Russian.

Analysis of the overall reliability of a solar energy converter unit composed of thermoelectric modules, as a function of the reliability of individual photocells and component modules. Expressions are given to determine the reliability of various module circuit designs having the modules in series, parallel and combined connections. The usefulness of redundancy in these designs is noted. Suggestions are given concerning the selection of module circuit designs most suitable for given operational requirements. V.Z.

A71-42536 # Efficiency of solar energy converters based on CdS-Cu(2-x)S heterojunctions (Effektivnost' preobrazovatelei solnechnoi energii na osnove geteroperekhodov CdS-Cu(2-x)S). S. Iu. Pavelets and G. A. Fedorus (Akademiia Nauk SSSR, Institut Poluprovodnikov, Leningrad, USSR). *Geliotekhnika*, no. 3, 1971, p. 38. 13 refs. In Russian.

Calculation of the efficiency of these semiconductor junctions in solar energy converters under optimal conditions. The characteristics of the photoeffect in these materials are discussed. Approaches to the efficiency enhancement in these photoconverters are analyzed. The maximum possible efficiency of photocells of this type is estimated. V.Z.

A71-44390 # Some properties of photoconverters based on compressed sintered tablets (CST) of CdS (Nekotorye svoistva fotopreobrazovatelei na osnove spressovannykh spechennykh

tabletok /SST/ CdS). A. I. Marchenko, G. A. Fedorus, and V. N. Zhukova. *Poluprovodnikovaia Tekhnika i Mikroelektronika*, no. 6, 1971, p. 101-107. 10 refs. In Russian.

Powdered CdS was compressed into tablets 0.5 to 1 mm thick, 10 and 2 mm in diameter. The tablets were sintered in argon, coated unilaterally with CuS by dipping in CuCl, and used as the material for photoelectric converters. A high sensitivity throughout the visible spectrum and a solar-to-electric energy conversion efficiency of 3.5% are established for the converters. The current-voltage and capacitance-voltage characteristics of the heterojunction of these converters are determined. A tunnel-recombination type of the junction is established. V.Z.

A72-11770 Concept for a satellite solar power system. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). *Chem Tech*, Oct. 1971, p. 606-614. 35 refs.

Description of a concept for a satellite solar power station that involves collection of solar energy conversion to electrical power, and generation and transmission of microwaves. The microwave power, beamed from the satellite to an earth antenna, is converted into electrical power to be distributed through conventional power distribution networks. The technology required for such a satellite solar power station is explored, including conversion of solar energy to electrical power with photovoltaic solar cells, transmission of electrical power over superconducting lines to microwave generators, generation transmission and interception of microwaves, guidance and control of the satellite, and conversion of microwave power to dc power. Consideration is given to the payloads to be placed into orbit, orbit location, satellite station assembly methods, microwave beam interactions with the atmosphere, satellite and earth installation dimensions, and ultimately cost projections. A.B.K.

A72-15891 # A proposed new concept for a solar-energy converter. R. L. Bailey (Florida, University, Gainesville, Fla.). *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, D.C., Nov. 28-Dec. 2, 1971, Paper 71-WA/Sol-1*. 5 p. 7 refs. Members, \$1.00; nonmembers, \$3.00. Research supported by the University of Florida.

The possibilities are explored to create high efficiency solar-electricity converters utilizing the wave-like properties of radiation interacting with absorber-converter elements. The concept is based on the feasibility of extending principles of power absorbing antennas and converters to the visible light range. The resulting proposed converter structure would have a rough surface texture and yield a dc output. It may have significant efficiency, cost, and fabricating advantages, particularly for large-scale terrestrial utilization of solar energy. The concept is called an Electromagnetic Wave Energy Converter. G.R.

A72-15892 * # The generation of pollution-free electrical power from solar energy. W. R. Cherry (NASA, Goddard Space Flight Center, Greenbelt, Md.). *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, D.C., Nov. 28-Dec. 2, 1971, Paper 71-WA/Sol-2*. 5 p. 9 refs. Members, \$1.00; nonmembers, \$3.00.

Projections of the U.S. electrical power demands over the next 30 years indicate that the U.S. could be in grave danger from power shortages, undesirable effluence, and thermal pollution. An appraisal of nonconventional methods of producing electrical power is conducted, giving particular attention to the conversion of solar energy into commercial quantities of electrical power by solar cells. It is found that 1% of the land area of the 48 states could provide the total electrical power requirements of the U.S. in the year 1990. The ultimate method of generating vast quantities of electrical power would be from a series of synchronous satellites which beam microwave power back to earth to be used wherever needed. Present high manufacturing costs of solar cells could be substantially reduced by using massive automated techniques employing abundant low cost materials. G.R.

A72-15893 * # Terrestrial adaptation of the thermal heliotrope. J. W. Fairbanks (NASA, Goddard Space Flight Center, Space Power Technology Branch, Greenbelt, Md.) and F. H. Morse (Maryland, University, Silver Spring, Md.). *American Society of Mechanical Engineers, Winter Annual Meeting, Washington, D.C., Nov. 28-Dec. 2, 1971, Paper 71-WA/Sol-10*. 10 p. 9 refs. Members, \$1.00; nonmembers, \$3.00.

The principle of using bimetal helical coils to cause solar arrays to track the sun in space is presently under consideration for array orientation on several spacecraft. Adaptation of this thermal heliotrope to terrestrial applications introduces additional design considerations. The dominance of solar-radiation energy input to the helical coil over convective energy losses has to be ensured, and wind effects must be minimized. As long as the cost of solar cells remains high, orientation will always result in a significant cost saving for the converter. G.R.

A72-16909 # Solar absorptance of a cylindrical solar cell array. A. J. Gopin (Hughes Aircraft Co., El Segundo, Calif.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 10th, San Diego, Calif., Jan. 17-19, 1972, Paper 72-57*. 8 p. Members, \$1.50; nonmembers, \$2.00.

Experiments were conducted to determine the change in the overall solar absorptance of a cylindrical solar array when the solar flux vector is inclined from the normal to the axis of rotation. The absorptances of two solar cell array samples of differing coverglass thicknesses were measured on a Gier-Dunkle integrating sphere at incidence angles of 20, 56, 77, and 83 deg from the normal. The analysis of the data indicates that the effective solar absorptance of a cylindrical solar cell array is within 5% of the near-normal value for the solar flux vector inclined as much as 65 deg from the normal. Beyond 65 deg, the solar absorptance decreases rapidly. T.M.

A72-17751 Telesun, the solar cell of the future (Telesun, die Solarzelle der Zukunft). H. Fischer and R. Gereth. AEG-Telefunken, *Technische Mitteilungen*, vol. 61, no. 6, 1971, p. 351, 352. In German.

Solar cells have recently been considerably improved. Single cells with a length of 6 cm and a width of 2 cm have been manufactured. These cells have noncorroding titanium (palladium) silver contacts. The cells are connected with each other by welding. Lossless wrap-around contacts, a titanium oxide antireflection layer, and improved photoelectric efficiency are characteristic features of the new 'telesun' cells. G.R.

A72-18625 # Power without pollution. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: *Space for mankind's benefit; Proceedings of the First International Space Congress, Huntsville, Ala., November 15-19, 1971. Preliminary Volume*. Huntsville, Ala., Huntsville Association of Technical Societies, 1971, p. 40-1 to 40-16. 25 refs.

Methods of conversion of solar energy to power are discussed as a possible source of power without pollution. The topics include N/P silicon solar cells, solar power transmission techniques, guidance and control of solar cell systems, cooling equipment, and weight and cost projections for satellite solar power stations. V.Z.

A72-18627 # Power and energy for posterity. R. R. Barthelemy and R. F. Cooper (USAF, Wright-Patterson AFB, Ohio). In: *Space for mankind's benefit; Proceedings of the First International Space Congress, Huntsville, Ala., November 15-19, 1971. Supplement*. Huntsville, Ala., Huntsville Association of Technical Societies, 1971, p. 23-31.

Prospective applications of modern power and energy producing technology to the benefit of the general public are considered, covering pollution-free energy generation to meet the future require-

ments in power, heat and propulsion, and in ground, air and space transportation. Individual types of energy generation are analyzed in terms of their utility value and their potentials in the reduction of air, noise, thermal, water, and nuclear pollution. V.Z.

A72-24314 # Calculation procedures and energetic characteristics for cooling systems with an atomizing-nozzle chamber and solar heaters (Metodika rascheta i energeticheskie pokazateli khodil'nykh ustanovok s forsunochnoi kameroy i solnechnymi nagrevatel'nyimi). A. Kakabaev and M. Golaev (Akademiia Nauk Turkmen-skoi SSR, Fiziko-Tekhnicheskii Institut, Ashkhabad, Turkmen SSR). *Geliotekhnika*, no. 5, 1971, p. 49-56. In Russian.

Discussion of a cooling system based on vaporization of a solar-cell-preheated solution in a heated air flow drawn through a chamber with an atomizing injector. Expressions are derived for working solution recycling control and for the output characteristics of this cooling system. V.Z.

A72-24315 # Selective surfaces and coatings in solar radiation engineering (Selektivnyye poverkhnosti i pokrytiya v geliotekhnike). M. M. Koltun (Gosudarstvennyi Nauchno-Issledovatel'skii Institut Istochnikov Toka, USSR). *Geliotekhnika*, no. 5, 1971, p. 70-80. 48 refs. In Russian.

Review of the literature in this field, covering selective coatings for semiconductor photoconverters, for solar energy converters using white-black surfaces, and for cooling systems using solar energy. The achievements in this field are summarized as the construction of a theoretical basis for the development of selective surfaces for solar energy conversion, and the fabrication of selective coatings with nearly optimal optical properties for all types of solar energy conversion systems. V.Z.

A72-24316 # Energy economics prognostication for the prospects of solar radiation utilization (Energoekonomicheskoe prognozirovaniye perspektiv ispol'zovaniia solnechnoi radiatsii). L. V. Gudkov, R. A. Zakhidov, and A. V. Sheklein (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR). *Geliotekhnika*, no. 5, 1971, p. 81-85. 5 refs. In Russian.

A theoretical basis is derived for forecasting the economic merits of various types of solar energy conversion systems. Formulas are given to evaluate the cost efficiency of systems using solar energy as compared to that of systems using other sources of energy. V.Z.

A72-28002 State of the CNES solar cell research and development programme. G. H. Coste (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France). In: *Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970*. London and New York, Gordon and Breach Science Publishers, 1971, p. 11-20.

Review of French solar cell R&D accomplishments and future trends. Following a brief historical summary, French research programs are shown to have been devoted to the development of silicon cells, improvement of silicon cell performance under irradiation, and exploratory projects on thin film solar cells including cadmium telluride and cadmium sulfide cells, graded gap structures, and indium phosphide layers. Activities of the present and trends of the immediate future are characterized by a struggle between silicon photovoltaic cells and thin layer cells. It is obviously possible to improve still further the performance of silicon cells by increasing their efficiency and reliability and by reducing their weight and cost. Yet, continued efforts devoted to thin layer cells seem well worthwhile, since the risks inherent in several unknowns affecting service life are counterbalanced by promises of solar generators of substantially lower weight and costs. M.V.E.

A72-28003 Solar cell development in the Federal Republic of Germany. H. R. Lösch (Gesellschaft für Weltraumforschung mbH, Bad Godesberg, West Germany). In: *Solar cells; Proceedings of the*

02 SOLAR ENERGY

International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 21-33. 39 refs.

Brief survey of German solar cell development activities, and review of their results. Performed work includes improvements of silicon solar cells, development of polycrystalline solar cells, and studies of deployable structures for large solar generators. New interconnection techniques, module design features, and filter applications are to improve the performance of cells. Prototypes of various deployable panels have been built. One of them is made of glassfiber-reinforced polymers. A planned solar electric propulsion module is intended to test ion thrusters, deployable solar cell arrays, and power conditioning systems. A list of publications of the last two years on German solar cell development activities is presented.

M.V.E.

A72-28005 Review of advanced solar generator development. K. K. Reinhartz (ESRO, European Space Research and Technology Centre, Noordwijk, Netherlands). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 51-63; Discussion, p. 64. 19 refs.

Advanced American and European solar generator technology developments are reviewed. U.S. work has been concentrated on roll-up solar cell arrays with flexible solar panels. Weight predictions range from 2.0 kg/sq m to 1.7 kg/sq m for arrays of 1.5 and 2.5 kW power. Different approaches to the stowage and deployment of flexible solar panels have been investigated by several U.S. companies. Since 1968, ESRO has also supported work related to the development of a roll-up array. In the first phase of this project, completed in June 1970, the main emphasis was on developing a flexible solar cell panel that could withstand the extreme temperature cycling requirements without cell performance degradation. In the present phase, the main components of the stowage and deployment system are studied.

M.V.E.

A72-28008 Study of the Cu/xS barrier layer in Cu-Cd-S solar cells. A. E. V. Aerschodt and K. K. Reinhartz (ESRO, European Space Research and Technology Centre, Noordwijk, Netherlands). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 95-109. 14 refs.

Discussion of the effect upon solar cell efficiency of the electrochemical potential of the cell during plating and of the composition of the plating solution. An important procedure in the manufacture of thin film Cu-Cd-S solar cells is the formation of a thin Cu(x)S surface layer on a CdS base layer by chemiplating in CuCl plating solutions. Electrochemical measurements on Cu(x)S electrodes in aqueous copper ion solutions have been performed recently, and the above-mentioned effect is discussed in the light of these measurements.

M.V.E.

A72-28016 Technological improvements on CdS solar cells. G. Coste (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France), J. Fremy, and D. T. Nguyen (Société Anonyme des Télécommunications, Paris, France). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 187-199. 9 refs.

Review of recent progress in CdS thin film solar cell development. The influence of the cadmium sulfide evaporation (substrate temperature and deposition rate) on cell efficiencies is determined. The copper sulfide layer formed by the chemical process plays an active part in photon-electron conversion. The short circuit-current mainly depends on etching and Cu₂S thickness. Gridding and encapsulation technologies are optimized (homogeneity of tem-

perature and pressure). On the basis of this study, a standard process for highly efficient solar cell fabrication is developed. Preliminary results on stability characterization are given.

(Author)

A72-28021 The use of thin film solar cells in the radio-voltaic generators. R. Bomal, A. Manin, and K. Steinschaden (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, Essonne, France). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 257-272. 11 refs.

The performance of thin-film solar cells depends on the characteristics of the radioisotopes and the band-gap of the semiconductor. Tritium sources offer many advantages for radiovoltaic conversion. A one microwatt generator with a design lifetime of 10 years is described. Generators for various applications are considered, giving attention to watches, cardiac pacemakers, and microelectronic power supplies.

G.R.

A72-28026 Increased output from silicon solar cells. P. A. Iles (Globe-Union, Inc., El Monte, Calif.). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 333-347.

Description of the development of advanced high-output silicon solar cells. Compared with the current solar cells having an upper limit to output power density of 15-16 milliwatts per sq cm, the new cells have an upper limit of 18 milliwatts per sq cm. The cells are compatible with all combinations of large area, thin cells, wrap-around contact structures, and with the various metal combinations used. Their probable impact upon the state-of-the-art is discussed.

O.H.

A72-28029 Some innovations in silicon solar cell technology. H. Fischer, R. Gereth, E. Link, S. Mattes, and W. Pschunder (Telefunken AG, Heilbronn, West Germany). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 375-388. 8 refs.

Advanced solar cell generators must operate in a predictable mode over a wide range of environmental conditions. Solar cell performance at low temperature and low illumination levels has been investigated. It could be demonstrated that anomalies in solar cell current-voltage characteristic are caused by different fabrication processes of the back contact. Instead of an ohmic contact a Schottky contact is achieved, whose nonlinear impedance characterizes the cell performance. It was shown that only if a p(+) layer is produced underneath the back contact maximum electrical performance of a solar cell can be achieved down to -196°C operation temperature and low illumination levels down to 5 mW/sq cm. Distorted current-voltage characteristics of solar cells could be attributed to an inversion layer and the formation of leakage channels along the edges of a cell.

(Author)

A72-28034 Design considerations on 'advanced' rigid or semi-rigid solar panels. J. Ciabrini and R. Elberg (Engins MATHA, S.A., Vélizy-Villacoublay, Yvelines, France). In: Solar cells; Proceedings of the International Colloquium, Toulouse, France, July 6-10, 1970. London and New York, Gordon and Breach Science Publishers, 1971, p. 457-464.

Description of the progress to date in the study of rigid and semirigid solar panel structures, designed for future geostationary satellites, and capable of supplying power of the order of 1 and 4 kW. Several basic structural concepts are compared from the point of view of performance, feasibility, and costs. High-performance materials and advanced technology are considered. The most promising options presently available are emphasized.

O.H.

A72-30225 # Solar elements based on heterojunctions of p-type GaAs/1-x/P/x/ and n-type GaAs (Solnechnye elementy na osnove geteroperekhodov p-GaAs/1-x/P/x/-n-GaAs). A. G. Cheban, V. V. Negreskul, P. T. Oush, L. V. Gorchak, G. I. Ungurianu, and V. G. Smirnov. *Radiotekhnika*, vol. 27, Mar. 1972, p. 30-33. 10 refs. In Russian.

Measured dark current-voltage characteristics, light current-voltage characteristics under load, and spectral response curves are given for photosensitive elements prepared by liquid epitaxial growth of p-type GaAs/1-x/P/x/ on an n-type GaAs substrate. Due to the absence of a conditioning surface layer, 30% of the radiation incident on the working surface is reflected, yielding an efficiency of 6 to 7%. Recommendations are given for improvement in this area. T.M.

A72-32131 * # Silicon solar cell efficiency - Practice and promise. H. W. Brandhorst, Jr. (NASA, Lewis Research Center, Cleveland, Ohio). *Institute of Electrical and Electronics Engineers, Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-5, 1972, Paper. 7 p.* 23 refs.

The maximum efficiency of silicon solar cells is calculated and yields a value near 18%. Additionally, the performance of these high efficiency cells in a synchronous orbit radiation field is calculated and indicates that these cells would be superior to present silicon cells at all times. The performance of conventional cells is analyzed and several areas in which performance gains may be achieved are discussed. These areas include improvements in diffused region profile, in reduction of excess forward currents in cells made from low resistivity material and in the theory for describing complex solar cell structures. (Author)

A72-34264 Theoretical and practical fill factors in solar cells. J. Lindmayer (Communications Satellite Corp., Washington, D.C.). *COMSAT Technical Review*, vol. 2, Spring 1972, p. 105-121. 5 refs.

The fill factor determines the fraction of power available to a load with respect to the open-circuit-voltage short-circuit-current product. This paper calculates the theoretically expected values and compares them with measured values. In silicon p-n junction energy converters, fill factor values over 0.82 are expected according to diffusion theory, but actual solar cells exhibit a fill factor of about 0.72. Recombination in the space charge region is found to be the reason for the reduced fill factor in practical cells. The mechanism discussed also has implications with respect to the open-circuit voltage. (Author)

A72-35509 # Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation (Termodinamicheskii analiz i optimizatsiia parametrov solnechnoi termoelektricheskoi energoustanovki s otvodom tepla izlucheniem). L. M. Drabkin (Tashkentskii Institut Inzhenerov Zheleznodorozhnogo Transporta, Tashkent, Uzbek SSR). *Geliotekhnika*, no. 3, 1972, p. 15-23. 8 refs. In Russian.

A72-35516 # A universal power characteristic of a high-temperature solar heat source (Universal'naya energeticheskaya kharakteristika solnechnogo vysokotemperaturnogo istochnika tepla). V. A. Grilikhes and V. M. Matveev. *Geliotekhnika*, no. 3, 1972, p. 68-71. 5 refs. In Russian.

A72-36075 Large-scale concentration and conversion of solar energy. A. F. Hildebrandt, G. M. Haas, W. R. Jenkins (Houston, University, Houston, Tex.), and J. P. Colaco. *EOS*, vol. 53, July 1972, p. 684-692. 31 refs.

Description of a proposed solar energy power plant which first concentrates the solar energy and then applies a thermodynamic conversion cycle. A concentrator is proposed which consists of a

large number of individual movable mirrors which reflect the solar energy onto a single collector atop a large tower. The concentrated energy can then be converted to electrical power either by means of a steam cycle, using liquid metals for heat transfer down the tower, or by a closed-cycle MHD generator; in this case preference is given to a closed-cycle MHD process employing an inert gas of helium with cesium seeding. The intermittent nature of the solar energy can be overcome by electrolyzing water into hydrogen and oxygen gas and storing the energy either in the form of compressed hydrogen and oxygen gas or as cryogenic liquids. Energy storage in the form of hydrogen is especially attractive, since it offers the possibility of a pollution-free fuel for the internal combustion engine. A.B.K.

A72-36681 Parallel operation of the solar generator and battery on the Symphonie satellite (Parallelbetrieb von Solar-generator und Batterie im Satelliten Symphonie). A. Schreger. *AEG-Telefunken, Technische Mitteilungen*, vol. 62, no. 3, 1972, p. 125-128. In German.

A72-37642 * # Solar array cost reduction. D. T. Bernatowicz (NASA, Lewis Research Center, Cleveland, Ohio). *U.S. Army, Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Paper. 10 p.*

The costs regarding solar power systems are considered, giving attention to the total system cost index for the power system as a function of solar array area, and the recurring cost per square foot for the solar array versus the total area flight arrays built for each project. It is found that the costs decrease as production volume increases. Design standardization together with improvements in solar cell and array technology show promise of reducing costs. A long range program has been started to improve substantially the efficiency of silicon cells. Efficiencies approaching 20% are theoretically possible. One obstacle to cost reduction is that the volume of production required to satisfy the space program is not enough to justify a high degree of mechanization or automation. G.R.

A72-37675 Remarks concerning solar furnaces in space. M. Hoëz and M. Foëx (CNRS, Laboratoire des Ultra-Réfractaires, Odeillo, Pyrénées-Orientales, France). *Solar Energy*, vol. 13, July 1972, p. 417-420. 6 refs.

Discussion of some of the opportunities offered by high-temperature, high-vacuum, solar-furnace processing of materials in space or on the moon. The high-temperature treatment (with or without fusion) of refractory metals (tungsten, tantalum, iridium) could eliminate certain of their gaseous or volatile impurities and render malleable products that at present cannot be prepared in other than very fragile form. Such processing in space vacuum could also open new avenues of research in physics and chemistry. Some of the problems posed by solar-furnace space experiments are reviewed. M.V.E.

A72-37780 Contribution to silicon solar cell technology. R. Gereth, H. Fischer, E. Link, S. Mattes, and W. Pschunder (Telefunken AG, Heilbronn, West Germany). *Energy Conversion*, vol. 12, Sept. 1972, p. 103-107. 22 refs.

Description of certain recent innovations in solar cell technology aimed at satisfying the high electrical power to weight ratio and resistance to extreme environmental conditions demanded by some of the space missions presently contemplated or in preparation. The innovations described include: (1) passivated, corrosion-resistant, and weldable Ti(Pd)Ag contacts which can be exposed to high temperatures and temperature cycles; (2) wrap-around contacts without degradation of maximum electrical power; (3) titanium-oxide anti-reflex coating resulting in a better optical match between cover glass and solar cell; and (4) controlled lifetime of minority carriers in the base region, yielding the ultimate technological conversion efficiency. M.V.E.

A72-43187 # Methods for the quality control of the reflecting surfaces of solar energy condensers (Survey) (Metody kontrolya kachestva otrazhaiushchikh poverkhnostei konsentratoren solnechnoi energii (Obzor)). V. A. Grilikhes. *Geliotekhnika*, no. 4, 1972, p. 3-15. 30 refs. In Russian.

A72-43194 # Calculation of the solar radiation incident on an inclined ribbed surface (Raschet solnechnoi radiatsii, padaiushchei na naklonno-rebristuiu poverkhnost'). Iu. N. Iakubov, G. Ia. Umarov, and K. B. Baibutayev (Bukharskii Pedagogicheskii Institut, Bukhara, Uzbek SSR). *Geliotekhnika*, no. 4, 1972, p. 60-63. In Russian.

Development of a method of calculating the direct solar radiation incident on a southward facing solar energy receiver with an inclined ribbed configuration. The proposed method is based on a study of the change in the azimuth of the chosen receiver with a change in the angles of inclination of two surfaces. A.B.K.

A72-45126 # Investigation of the possibility of using radiant solar energy for welding and soldering of materials (Issledovanie vozmozhnosti ispol'zovaniia luchistoi energii solntsa dlia svarki i paiki materialov). I. N. Frantsevich, V. S. Dverniakov, V. V. Pasichnyi, N. A. Shiganov, and Iu. I. Korunov (Akademiia Nauk Ukrainsoi SSR, Kiev, Ukrainian SSR). *International Astronautical Federation, International Astronautical Congress, 23rd, Vienna, Austria, Oct. 8-15, 1972, Paper*. 10 p. In Russian.

Description of solar-furnace equipment and test results in a simulation study of the feasibility of using solar energy for welding, soldering, and heat treatment of metals in space. Solar energy was concentrated by a parabolic reflector (2-m diameter) providing a flux density of about 20,000 cal/sq cm per min in a focal point 8 mm in diameter at normal solar irradiation. The flux was focused on samples held in a vacuum chamber with a quartz window. Energy losses in the quartz window and in the atmosphere are evaluated, and test data are given for welds in tubular samples of steel and titanium alloy. Overall results demonstrate the feasibility of solar welding both in space and on the earth surface. T.M.

A73-10132 High-efficiency Ga_{1-x}Al_xAs-GaAs solar cells. J. M. Woodall and H. J. Hovel (IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.). *Applied Physics Letters*, vol. 21, Oct. 15, 1972, p. 379-381. 8 refs.

It is shown that heterojunction cells consisting of Ga_{1-x}Al_xAs on a GaAs substrate possess highly improved efficiencies as compared to conventional homojunction (Si and GaAs) cells. The improved efficiency is attributed to the reduction of both series-resistance and surface-recombination losses resulting from the presence of the heavily doped Ga_{1-x}Al_xAs layer. V.P.

A73-12048 Secondary ionisation and its possible bearing on the performance of a solar cell. S. Deb (Jadavpur University, Calcutta, India) and H. Saha (Jadavpur University, Calcutta; Kalyani, University, Nadia, West Bengal, India). *Solid-State Electronics*, vol. 15, Dec. 1972, p. 1389-1391. 7 refs.

A73-14203 Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. Conference sponsored by the Institute of Electrical and Electronics Engineers. New York, Institute of Electrical and Electronics Engineers, Inc., 1972. 400 p. Members, \$15.; nonmembers, \$20.

Topics discussed include new developments in silicon solar cells, Cu₂S-CdS and other compound solar cells, solar cell module technology, space applications of solar cells, space environmental effects on solar cell operation, and terrestrial applications of solar cell arrays. In particular, studies are made of the solar cells used for the Helios sun probe, the flight of a sun-tracking flexible rolled-up

solar array, and the solar array system for the Skylab orbital workshop. Also, the results of studies of the role of lithium additives in annealing radiation-induced defects in silicon solar cells are presented.

Individual items are announced in this issue.

A.B.K.

A73-14204 Evolution of silicon solar cell design. P. A. Iles (Globe Union, Inc., El Monte, Calif.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 1-5.

This paper surveys the wide range of processing variables which can be used to fabricate silicon solar cells. It describes the more complex cell designs which have evolved. Present cells while simple in appearance, are seen to be fairly sophisticated. (Author)

A73-14207 Advances in graded gap solar cell research. G. Cohen-Solal, L. Svob, Y. Marfaing (CNRS, Laboratoire de Physique des Solides, Meudon, Hauts-de-Seine, France), E. Janik (Instytut Elektrotechniki, Warsaw, Poland), and E. Castro (Facultad de Ingenieria, Buenos Aires, Argentina). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 28-36. Research supported by the Centre National d'Etudes Spatiales.

An experimental investigation regarding two graded band gap systems is reported, including (ZnHg)Te and (CdHg)Te solar cells. Attention is given to the preparation of semiconductor layers, current-voltage characteristics, and spectral response curves. It is found that it is possible to prepare graded band gap p-n junctions with good electrical and photoelectrical properties. Best results were obtained with Cd-Hg-Te solid solutions. G.R.

A73-14209 * The 'Silicon Solar Cell Design Handbook,' M. Wolf (Pennsylvania, University, Philadelphia, Pa.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 53-60. 9 refs. Grant No. NGL-39-010-001.

The design activities are divided in the handbook into three parts, which are concerned with the light-generated current, the open-circuit voltage, and the fill factor. Each of these parts is further divided into sections, which take into account the individual regions of the device. The basis of the design data for light-generated current and of the design data related to the current-voltage characteristic is discussed together with sample design curves. G.R.

A73-14210 Laser activation of solar cells. C. E. Backus (California, University, Los Alamos, N. Mex.; Arizona State University, Tempe, Ariz.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 61-65. 5 refs. AEC-sponsored research.

A preliminary investigation has been conducted on the feasibility of using photovoltaic cells to convert laser energy into electrical energy. The tests were made with readily available solar cells and lasers. When using the He-Ne laser, the efficiencies of the silicon cells were improved by about 50% compared to operation in sunlight. The improvement in efficiency could have conceivably been increased to about 90% if an optimum wavelength laser were used. Efficiencies of GaAs cells also were improved about 50% but could perhaps have been increased to about 130% with an appropriate laser. (Author)

A73-14212 An improved silicon solar cell - The violet cell. J. Lindmayer and J. Allison (COMSAT Laboratories, Clarksburg, Md.). In: Photovoltaic Specialists Conference, 9th, Silver Spring,

Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 83, 84.

In the violet cell the spectral response has been extended to wavelengths as short as 0.3 micrometers. A significant improvement of the solar cell current was obtained as a result of this extension. The conversion efficiency has been further improved by an increased fill factor. The overall improvement in the conversion efficiency obtained is about 30% relative to state-of-the-art cells for space applications. G.R.

A73-14213 Vertical multijunction solar cell. P. Stella and A. Gover (Textron, Inc., Sylmar, Calif.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 85, 86. Contract No. F33615-72-C-1310.

Minority carrier lifetime and the diffusion constant were determined as a function of impurity concentration in a double-junction multifunction vertical solar cell. The efficiency of a solar cell of this design was also deduced from power output calculations and current and voltage calculation at maximum power. A diagram is given to show the results. V.Z.

A73-14216 High efficiency Cu₂S-CdS solar cells with improved thermal stability. K. Bogus and S. Mattes (Telefunken AG, Heilbronn, West Germany). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 106-110. 5 refs.

The effect of thin metal films on Cu₂S-CdS solar cells has been investigated. By deposition of a thin copper layer it is possible to increase the short circuit current and the efficiency to optimum values. A similar behavior is observed after a glow discharge treatment in hydrogen. Besides improving the solar cell efficiency these procedures have a balancing effect on final performance of cells with different fabrication parameters. (Author)

A73-14220 New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell. D. Bonnet and H. Rabenhorst (Battelle-Institut, Frankfurt am Main, West Germany). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 129-132. 9 refs. Research supported by the Bundesministerium für Bildung und Wissenschaft.

The objective of this work is the development of a thin-film graded-gap CdTe-CdS p-n heterojunction solar cell. As a first step an abrupt heterojunction between p-CdTe and n-CdS has been studied. The CdTe layer is produced by a high temperature gas transport method, the CdS is deposited by the conventional method of high-vacuum evaporation. The cells exhibit an efficiency between 5 and 6% under illumination with simulated solar light of 50 mW/sq cm at room temperature. (Author)

A73-14222 Investigations of the inhomogeneity of polycrystalline Cu_x/S-CdS solar cells. G. H. Hewig and F. Pfisterer (Stuttgart, Universität, Stuttgart, West Germany). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 138-141. 9 refs. Gesellschaft für Weltraumforschung Contract No. RV-I-1-TO-3/71-B.

The local distribution of the surface potential and the photovoltaic efficiency of a Cu(x)S-CdS solar cell have been studied by scanning techniques. A scanning electron beam and a scanning light beam yield information on the surface potential and on the local photovoltaic efficiency. Degraded cells exhibit large inhomogeneous regions, whereas a Cu(x)S-CdS solar cell with improved stability of

AEG-Telefunken Heilbronn exhibits a homogeneous photovoltaic effect over the total cell area. (Author)

A73-14226 Solar cell optical design considerations. R. W. Opjorden (Hughes Aircraft Co., El Segundo, Calif.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 164-173.

For the past several years, the Power Systems Department at Hughes has been engaged in the study, both theoretical and experimental, of the effect of the solar cell's complex optical properties on solar panel electrical performance. In other words, the solar cell is recognized as an optical instrument, not simply as an electronic black box. Cell optical constraints on panel design are important for missions that involve high and low temperatures and/or nonnormal incident illumination. Under such conditions, solar cells and cover slides purchased under normal incidence, 25 C specifications shift in performance, yielding unnecessary performance penalties. Consideration and optimization of optical properties yields performance gains and cost savings in panel design. (Author)

A73-14237 Status report on RAE advanced solar array development. F. C. Treble (Royal Aircraft Establishment, Farnborough, Hants., England). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 254-262. 11 refs.

Recent progress in RAE advanced lightweight solar array technology is reviewed. Solar cell performance has been improved. Panel assemblies embodying the RAE cementless mounting technique have successfully withstood prolonged deep thermal cycling and other environmental tests. Some are currently being flown experimentally on the Prospero technological satellite. A stowed array has survived severe vibration with negligible damage. A solution has been found to the problem of protecting the backs of the cells from low energy protons. Useful experience has been gained in all aspects of the manufacture, handling and testing of flexible folding arrays. Design qualification tests have begun on a 280 W prototype. The advantages and disadvantages of the RAE design in relation to the alternative roll-up type are discussed. (Author)

A73-14242 Lithium solar cell technology. P. A. Iles (Globe-Union, Inc., El Monte, Calif.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 296-302. 9 refs.

The current status of lithium-doped solar cells is considered with particular attention to their fabrication criteria and mission design factors. The effects of various lithium distributions on the current-voltage characteristics of solar cells are discussed. Lithium-doped solar cells are characterized as ones having the highest output ever obtained in solar cells in sunlight both in space and at the earth's surface. V.Z.

A73-14250 Cost goals for silicon solar arrays for large scale terrestrial applications. M. Wolf (Pennsylvania, University, Philadelphia, Pa.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 342-350. 8 refs.

A73-14251 * Feasibility of low cost silicon solar cells. C. G. Currin, W. A. Smith (Dow Corning Corp., Hemlock, Mich.), K. S. Ling (Globe-Union, Inc., El Monte, Calif.), E. L. Ralph (Textron, Inc., Sylmar, Calif.), and R. J. Stirn (California Institute of

02 SOLAR ENERGY

Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 363-369, 7 refs.

Future costs of silicon solar cells are projected on the basis of more than a thousand-fold increase in volume. If no major application of new manufacturing technology is made, the cost remains excessive for any large scale energy system. However, the development of a multiple-ribbon crystal growth process could permit a 300-fold reduction in cell costs to about \$375/kW of cell output. (Author)

A73-14253 Solar arrays for terrestrial applications and sounding balloons. Y. Salles (Radiotechnique-Compelec, Suresnes, Hauts-de-Seine, France). In: Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 382-385.

Review of the technical evolution which has led to the present type of solar land generators. The results of the operation of solar energy plants in various parts of the world are cited, noting some technological problems caused by the environment and the solutions proposed. An evaluation is made of the future prospects for solar generators, and, in particular, an estimate is made of the cost of generating energy by means of solar cell arrays. In addition, three types of solar generators for powering the gondolas attached to sounding balloons are described. A.B.K.

A73-15801 # The feasibility of a satellite solar power station. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 26-30, 1972, Paper 72-WA/Sol-6*. 5 p. 6 refs. Members, \$1.00; nonmembers, \$3.00.

The concept of a satellite solar power station which would have the capability to convert solar energy to microwaves which are beamed to a receiving antenna to produce power on Earth is presented. The state-of-the-art of the technology required to achieve efficient solar energy conversion, microwave power generation, transmission and rectification is reviewed. Approaches to structural design, flight control and Earth-to-Orbit transportation are presented. (Author)

A73-15802 # Thermal performance of a linear solar collector. A. B. Meinel (Arizona, University, Tucson, Ariz.) and M. P. Meinel (Helio Associates, Inc., Tucson, Ariz.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 26-30, 1972, Paper 72-WA/Sol-7*. 4 p. Members, \$1.00; nonmembers, \$3.00. NSF Grant No. G1-30022.

A series of graphs presents the relationships between the optical system factors and the resulting system efficiency of a linear solar collector. The range of operating temperature is 200 to 600 C for a wide range of surface selectivities and optical flux concentrations. (Author)

A73-16816 Schottky barrier diodes for solar energy conversion. W. A. Anderson and A. E. Delahoy (Rutgers University, New Brunswick, N.J.). *IEEE, Proceedings*, vol. 60, Nov. 1972, p. 1457, 1458. 5 refs. NSF Grant No. G1-32726.

Several Schottky barrier solar cells were fabricated by evaporation and sputtering of Al ohmic contacts and Cr or AuCr alloy barrier metals on 0.5-10.0 ohm-cm p-type silicon. Potential efficiencies of 4.8 to 12 percent were observed which would be realized with improved fill factors. Computer studies of the optical problem indicate an output power increase by a factor of four through the use of reduced barrier metal thickness (from 275 to 100 Å) and alloy barrier metals to more effectively transmit solar energy to the Schottky junction. (Author)

A73-18027 Space resources to benefit the earth. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). (*New York Academy of Sciences, Conference on Planetology and Space Mission Planning, 3rd, New York, N.Y., Oct. 28-30, 1970*). *New York Academy of Sciences, Annals*, vol. 187, Jan. 25, 1972, p. 406-419, 43 refs.

Discussion of the potential benefits that may be derived from future space missions, with special attention to space as a source of energy. The possibilities held forth by a satellite solar power station concept are reviewed in terms of the solar-energy conversion technology status, microwave generation and beam transmission, conversion of microwave power to DC power, and weight and cost projections. M.V.E.

A73-18028 Electrical and isotope power from space for terrestrial use. T. B. Taylor (International Research and Technology Corp., Washington, D.C.). (*New York Academy of Sciences, Conference on Planetology and Space Mission Planning, 3rd, New York, N.Y., Oct. 28-30, 1970*). *New York Academy of Sciences, Annals*, vol. 187, Jan. 25, 1972, p. 420-426.

The concept of an orbital facility for converting solar energy to stored fission energy for use in terrestrial power plants is reviewed in terms of overall system parameters and economics. It is suggested that the concept is worth studying in considerably greater detail. M.V.E.

A73-18976 Solar generator technology on the Symphonie satellite. M. Berniere (Société Anonyme de Télécommunications, Paris, France). In: French space technology. Volume 2.

Paris, Information Propagande Françaises, Editeur; Centre National d'Etudes Spatiales, 1972, p. 231-240. In English and French.

Consideration of the problems involved in the development of solar generators for a communication satellite stabilized about three axes in synchronous orbit. The solution chosen for the Symphonie satellite is one in which the solar generator is a fixed 24-hour orbit generator interlocked with the satellite. Problems in reducing the thermal constraints in such a design are considered, as well as problems in achieving proper interconnection between solar cells and the problem of choosing the proper welding method. The results of a five-year program of simulated space qualification testing are cited. A.B.K.

A73-22438 A system for the evaluation of solar cell samples. H. L. Skolnik (Harris Semiconductor, Melbourne, Fla.). *Solar Energy*, vol. 14, Dec. 1972, p. 43-54.

The system described is a solar cell test vehicle intended primarily for education and research applications. Because of the many advantages to be derived from testing cells under real sky conditions, the sun is utilized as the system's energy source. The system design provides for the measurement of open-circuit voltage, short-circuit current, internal impedance, and output power, each as a function of incident energy. A means for the accurate angular positioning of the solar cell provides for the determination of cosine response. A specially-designed, direct reading pyrheliometer featuring fast response provides normal incident radiation data, allowing for the accurate determination of conversion efficiency. Spectral response measurements are made by comparing the output of the cell under test, both with and without accessory bandpass filters. The temperatures of both the solar cell and the ambient air can be monitored for future data correlation. A clock drive provides for the continuous alignment of the sample holder with the sun, allowing for measurements over extended periods of time. Samples as large as 4.3 in. in diameter can be accommodated. (Author)

A73-22439 Developments in solar cell generators. E. G. Suppa and J. Heinicke (Messerschmitt-Bölkow-Blohm GmbH, Ottobrunn, West Germany). *Solar Energy*, vol. 14, Dec. 1972, p. 55-65, 8 refs.

The European satellite projects of today and the near future, to be applied for measuring tasks demanding highest accuracy or used in missions of extended lifetime, have stimulated the development of new solar cell module concepts. Low outgassing rates, magnetic and electric cleanliness (as achieved by conductive coatings), high thermal cycling capability and extended lifetime (by improved solar cell interconnection techniques), high temperature capability for sun missions or healing radiation damage, integral cover slips for reducing weight, and high module flexibility for use on deployable large-area panels mark the trends in module development. Based on the work for the German AEROS satellite project and the work on roll-up structures, the module concepts are described and test results are given. Power data on the solar cells are reported and compared with the results of JPL balloon flights and the measurements in the DIAL project. Advanced developments are discussed. (Author)

A73-22440 Passive solar array orientation devices for terrestrial application. J. W. Fairbanks (NASA, Goddard Space Flight Center, Space Power Technology Branch, Greenbelt, Md.) and F. H. Morse (Maryland, University, College Park, Md.). *Solar Energy*, vol. 14, Dec. 1972, p. 67-79. 9 refs.

A passive solar array orientation device, called a thermal heliotrope, is described, and several terrestrial applications are illustrated. The thermal heliotrope consists of a bimetallic helical coil that serves as the motor element, producing torque and angular displacement. A control mechanism in the form of one or more shades completes the basic device. In comparison with electro-mechanical tracking systems, the thermal heliotrope is electrically passive, has relatively few parts, and is low cost. After describing the principle of operation and several models built for space applications, the design considerations for several terrestrial thermal heliotrope units are presented. It is suggested that the use of the thermal heliotrope for solar array orientation could significantly reduce array cost, thereby increasing the competitive economic posture of solar arrays for terrestrial applications. The thermal heliotrope modified for terrestrial use is readily adaptable to orient solar energy concentrators, such as furnaces and stills. (Author)

A73-22782 Configuration survey of lightweight solar array power systems for future missions. D. R. Lott (Lockheed Missiles and Space, Inc., Electrical Power Systems Dept., Sunnyvale, Calif.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 430-437. 11 refs.

A73-22785 * A dynamic solar-electric power/thermal control system for spacecraft. B. K. Davis (NASA, Marshall Space Flight Center, Huntsville, Ala.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 457-465. 8 refs.

This paper describes a solar-electric power and active thermal control system for spacecraft with solar energy to electricity conversion efficiency of more than 20%. Briefly, the solar heat energy is absorbed by flat plate collectors yielding above 70% of the energy incident for conversion by an organic condensing cycle. The cycle operates between 132 and 6.67 deg C. The working fluid is F-114 which flows through a solar collector to absorb heat, then through a regenerator and into the radiator where it is condensed to a liquid. The cold liquid flows through two paths, one providing regenerator cooling, the other providing spacecraft thermal control. The system total weight is about 170kg/kW of electrical energy produced. The dynamic system replaces batteries by a thermal capacitor for eclipse period energy storage, thereby eliminating many battery charging and control problems as well as improving efficiency and weight characteristics of the system. (Author)

A73-22791 Satellite solar power station - An option for power generation. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 507-511. 7 refs.

The principle on which a satellite solar power station (SSPS) is based is the conversion of solar energy into electricity. This electricity would be fed to microwave generators arranged to form an antenna which, in turn, could direct a beam to a receiving station on the earth where the microwave energy could be efficiently and safely converted back to electricity to meet baseload power needs. The status of the technology required to meet the objectives of an SSPS is discussed. F.R.L.

A73-22792 The Solar Collector Thermal Power System - Its potential and development status. E. T. Mahefkey, Jr. (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 512-521. 28 refs.

The evolution of the Vuilleumier cryogenic cooler as the foremost cryogenic refrigerator candidate for several military and scientific spacecraft applications has prompted interest in a Solar Collector Thermal Power System (SCTPS) to provide the necessary thermal energy input. The Air Force Aero Propulsion Laboratory has sponsored both in-house and contractual study efforts to define the performance potential of (SCTPS). The results of these studies, and corroborative experimental results on system component performance characteristics are described. The performance (efficiency weight, volume, deployed area), costs, and integration ease of the SCTPS are compared to that of a conventional solar cell array-battery and a modified SNAP-10A nuclear reactor system. These comparisons show the SCTPS offers greater than a 50% weight reduction over the competitors, and the deployed area of the SCTPS is only 20% that of a solar array-battery system. Efficiency of the SCTPS is predicted to be 50% for the solar to thermal conversion and heat transport/thermal energy storage processes. (Author)

A73-22814 A systems engineering overview of the satellite power station. J. Mockovciak, Jr. (Grumman Aerospace Corp., Bethpage, N.Y.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 712-719. 11 refs.

The utilization of solar energy as a prime power source has been a long-held dream of mankind. With increasing attention focusing on the energy crisis, many new schemes are being proposed involving both space-based and ground-based applications of solar energy. Among these is a proposed concept of a satellite solar power station (SSPS), which collects energy from the sun and transmits it to earth via microwave for conversion to electrical power. Recent systems engineering studies, assessing the technical and economic aspects of the SSPS are presented. These studies indicate that the basic concept is technically feasible, and that it should be examined and compared to other potential energy systems. (Author)

A73-23601 Satellite power stations - A new source of energy. W. C. Brown (Raytheon Co., Lexington, Mass.). *IEEE Spectrum*, vol. 10, Mar. 1973, p. 38-47. 30 refs.

It has been suggested by Glaser (1968) that large arrays of solar photovoltaic cells should be placed into space in near-equatorial synchronous orbit where the sun would shine upon them nearly 100 per cent of the time. The dc power obtained from the photovoltaic arrays would then be converted into microwave power, beamed to the surface of the earth, and there converted back into dc power. This concept has become known as the Satellite Solar Power Station

02 SOLAR ENERGY

(SSPS). The system configuration and characteristics of the SSPS are discussed together with the solar photovoltaic cell array, details of the microwave power transmission system, and side effects of the SSPS system. G.R.

A73-24554 The potential of power from space. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: EASCON '72; Electronics and Aerospace Systems Convention, Washington, D.C., October 16-18, 1972, Record. (A73-24551 10-34) New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 34-41. 18 refs.

The concept of a satellite solar power station which would have the capability to convert solar energy to microwaves that are beamed to a receiving antenna on earth is presented. Approaches to structural design, flight control, and earth-to-orbit transportation are presented. Criteria for technology assessment and standards for cost comparisons are discussed. It is concluded that the option this concept offers for large-scale use of solar energy could meet a significant portion of future energy demands. M.V.E.

A73-26001 * # Concept for a high voltage solar array with integral power conditioning. P. Wiener (California Institute of Technology, Jet Propulsion Laboratory, Power Systems Group, Pasadena, Calif.) and R. Rasmussen (General Electric Co., Space Div., Valley Forge, Pa.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970, Volume 1. Hinsdale, Ill., American Nuclear Society, 1972, p. 10-19 to 10-30. Contract No. NAS3-8997.

Description of a general case solution that synthesizes a high voltage solar array system from a switchable building block concept which makes possible system optimization for specific load requirements. A specific optimized solution is demonstrated, with performance estimates relating array area, weight, and power. Significant technology problems peculiar to a high-voltage switchable solar array design are discussed, along with special requirements anticipated during a hardware development effort. M.V.E.

A73-29590 Historical development of solar cells. M. Wolf (Pennsylvania, University, Philadelphia, Pa.). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 120-124.

The historical development of solar cell technology is briefly reviewed, with emphasis on recent developments and on data which are not generally available. The general conclusion is that the silicon solar cell is firmly established as the mainstay of space power and that it will continue to fulfill this role. Effort will be spent on further improvement of its efficiency, with 20% being held as the goal which might be reached within the present decade. The cadmium sulfide thin film cell is a strong contender for the terrestrial solar cell market, but it will have to be established that the reliability and operating life of this cell are adequate. T.M.

A73-29591 Principles of photovoltaic solar energy conversion. J. J. Loferski (Brown University, Providence, R.I.). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 124-127.

The current level of theoretical knowledge on the photovoltaic effect in semiconductors is surveyed by examining processes involving generation of positive and negative carrier pairs in excess of thermal equilibrium concentrations, charge separation in the photovoltaic cell, and migration of carriers to the charge separation site. Performance data indicate that no semiconductor has reached its predicted maximum efficiency in solar cell applications. In the case

of silicon, this failure to reach predicted maximum efficiency is attributed to inadequate quality of the semiconductor material comprising the cell. T.M.

A73-29592 * Solar array cost reductions. D. T. Bernatowicz (NASA, Lewis Research Center, Cleveland, Ohio). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 128-130.

There is great interest in reducing the cost of solar arrays, which will continue to be the prime power source for unmanned spacecraft for some time. The cost of solar power systems over the last decade, and means by which cost reductions may be achieved in the future are discussed. It is shown that the total system cost index is a function of solar array area, and that cost decreases as production of solar arrays goes up. This effect can be exploited more than has been done in the past by making common building blocks from which a variety of arrays can be assembled. F.R.L.

A73-29593 * Large area silicon solar array development. J. V. Goldsmith (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 130-133.

Solar array technology has made significant improvements during the past five years in terms of the design and application of multikilowatt systems and in improvements of the specific power output capabilities of the arrays. The progress in array performance has been primarily due to array design. Experience in building, testing, and flying flexible arrays is giving confidence that they can be safely integrated into many spacecraft designs without deleterious coupling with the spacecraft control system. F.R.L.

A73-29594 * Research plans for solar power in space. E. M. Cohn (NASA, Washington, D.C.). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 139-141.

The developments in space solar power technology are reviewed, with the emphasis on solar power output improvement as the goal of further efforts. It is contended that the biggest pay-off should be expected not from cost cutting in solar cell fabrication but from versatile improvement of solar cell designs to a feasible maximum. V.Z.

A73-29595 Solar energy conversion development relative to Department of Defense space power requirements. J. F. Wise (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 141-145. 9 refs.

A73-29596 * Advanced spacecraft fuel cell systems. L. H. Thaller (NASA, Lewis Research Center, Cleveland, Ohio). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 152-155.

An evolutionary advanced technology program is described which is aimed at meeting the requirements of the next generation of fuel cell systems as well as providing technology fallout to ongoing mission oriented programs. The specific goals of the system selected for development are for 10,000 hr of operation with refurbishment, 20 lb/kW at a sustained power of 7 kW, and 21 kW peaking capability for durations of two hours. The system is designed to operate on low pressure propulsion grade hydrogen and oxygen. F.R.L.

A73-29597 Megawatt fuel cells for aerospace applications.

D. R. Warnock (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 155-158.

Description of a high power density fuel cell stack concept with an aqueous potassium hydroxide electrolyte contained in a capillary matrix of asbestos and potassium titanate. A porous sintered plate in partial contact with a hydrogen electrode forms a hydrogen flow field and serves as an additional container for the electrolyte. The high power density of the cells largely due to the low ohmic polarization capability of the thin matrix. Preliminary tradeoff studies on a very large reference system indicate that the fuel cell system should have a slightly higher fixed weight and a slightly lower full-load reactant consumption rate than alternate power systems.

V.Z.

A73-30475 Investigations on CdTe thin film solar cells. E. W. Justi, J. Seredynski (Braunschweig, Technische Universität, Braunschweig, West Germany), and G. Schneider. *Energy Conversion*, vol. 13, Apr. 1973, p. 53-56. 24 refs.

CdTe films were fabricated by direct synthesis of the vacuum evaporated elements Cd and Te following Heyerdahl and Harvey (1965). Both source temperatures and the substrate temperature must be controlled. The CdTe films were evaporated in a high vacuum coating unit. The influences of the CdTe film production process, of substrate layers and surface treatment, and of metallic collector grids are studied. After some hours storage in an exsiccator at room temperature the solar cells showed an increase of efficiency.

F.R.L.

A73-32193 * # The utilization of solar energy to help meet our nation's energy needs. R. L. Thomas (NASA, Lewis Research Center, Cleveland, Ohio). *National Professional Societies of New Mexico, Energy Crisis Symposium, Albuquerque, N. Mex., May 3, 4, 1973, Paper*. 26 p. 19 refs.**A73-32718** The feasibility of a satellite solar power station. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: NEREM 72; Northeast Electronics Research and Engineering Meeting, Boston, Mass., October 30-November 3, 1972, Record. Part 1. (A73-32717 16-09) Newton, Mass., Institute of Electrical and Electronics Engineers, Inc., 1972, p. 30-33.

Discussion of the technological, economic, and social considerations affecting the development of a satellite solar power station employing two extensive, symmetrically arranged solar cell arrays to produce electricity by photovoltaic conversion in synchronous orbit. The electricity from the solar cells is fed to microwave generators arranged to form an antenna located between the two arrays. The antenna directs the microwave beam to a receiving antenna on earth where the microwave energy is efficiently and safely converted back to electricity. Attention is given to expected developments in solar cell weight reduction, efficiencies of power conversion at each step of the process, satellite structural considerations, transportation tasks, economic merits of the project, and social implications. T.M.

A73-34283 # Analysis of the parameters of solar-heat power sources with energy storage units (Analiz parametrov solnechnykh teplovyykh energoustanovok s akkumulyatorami energii). V. M. Matveev and V. A. Grilikhes. *Gefiotehnika*, no. 2, 1973, p. 15-20. 5 refs. In Russian.

Analysis of the influence of the energy storage system on the parameters of a space power source providing electricity by conversion of solar heat. It is required that the electric power output should remain constant throughout the dark and light portions of periodic solar illumination. A universal ratio is derived which makes it possible to estimate the optimal (with respect to minimum weight)

temperature gradient over the light-dark cycle. Comparison is made between systems employing storage of thermal energy prior to conversion into electric power and systems employing storage of converted electric power by means of electrochemical storage batteries. T.M.

A73-35312 * Some major terrestrial applications of solar energy. W. R. Cherry (NASA, Goddard Space Flight Center, Greenbelt, Md.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-30, 1973, Technical Papers. New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 6/3-1 to 6/3-8. 10 refs.**A73-35313** Solar power via satellite. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). In: Institute of Electrical and Electronics Engineers, International Convention and Exposition, New York, N.Y., March 26-30, 1973, Technical Papers.

New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 6/4-1 to 6/4-10. 24 refs.

There is justification for a reexamination of the potential of solar energy because among the different sources of energy, whether they be nonrenewable, such as fossil or nuclear fuels, or continuous, such as tidal or geothermal, none has a greater potential or represents, at least in mankind's terms, a more constant and inexhaustible energy source. The most favorable conditions for solar energy conversion are out in space in an orbit around the sun. The development of an economic earth-to-orbit transportation system based on the space shuttle opens up the option to carry out solar energy conversion in a satellite solar power station (SSPS) in synchronous orbit, with only the final conversion step taking place on the earth. Solar power via satellites could provide an economically viable and socially acceptable option to meet future world energy requirements. F.R.L.

A73-36331 # Solar power. E. R. G. Eckert (Minnesota, University, Minneapolis, Minn.). *American Institute of Aeronautics and Astronautics, Thermophysics Conference, 8th, Palm Springs, Calif., July 16-18, 1973, Paper 73-710*. 7 p. 10 refs. Members, \$1.50; nonmembers, \$2.00.

Discussion of the conversion of solar energy into thermal, chemical or electric energy. A crucial element in any scheme is shown to be the design of the solar collector. The conditions imposed by the specific application and the possibilities to obtain high collection efficiencies are investigated. Recent thin film technology developments are pointed out that have provided means for improvement of the absorber and the glass envelope of the collector. The storage of energy is also discussed. M.V.E.

A73-37969 # Thermal control materials and technology in the 1970's. J. E. Gilligan and G. A. Zerlaut (IIT Research Institute, Chicago, Ill.). *SAE, ASME, AIAA, ASMA, and AIChE, Intersociety Conference on Environmental Systems, San Diego, Calif., July 16-19, 1973, ASME Paper 73-ENAS-7*. 4 p. 13 refs. Members, \$1.00; nonmembers, \$3.00.

Recent activities in the research and development of stable spacecraft thermal controls materials and systems are reviewed, and projections are made for the expected achievements in this and other fields. In addition to the need to solve a synergistic reaction between zinc orthotitanate and certain siloxane vehicles, an additional requirement - that such systems be noncontaminating and noncontaminable - has added an important, and difficult dimension to the development of these coatings/surfaces. In the paper the R & D of an ultrastable, low alpha sub s/epsilon paint consisting of zinc orthotitanate and a modified commercial silicone is described. Some of the applications and materials requirements for solar energy utilization are discussed. The special requirements of electroconductive surfaces for reproduction and other uses are also briefly reviewed in light of applicable space thermophysics technology. (Author)

02 SOLAR ENERGY

A73-38404 # Feasibility of large-scale orbital solar/thermal power generation. J. T. Patha and G. R. Woodcock (Boeing Co., Seattle, Wash.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. (A73-38386 19-03) New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 312-319. 21 refs.

Discussion of a thermal conversion concept which is potentially feasible with today's solar concentrator technology and component efficiencies, if the low earth orbit transportation cost is approximately \$60/lb. The system is also potentially feasible with space shuttle transportation cost of approximately \$160/lb and 1980 component efficiencies if the solar concentrator can be constructed at approximately 0.03 lb/sq ft. The above conclusions are based on a projected competitive busbar value of electrical energy of 2 to 3 cents per kilowatt-hour. Projections indicate that launch systems technology can be expected ultimately to attain transportation costs as low as \$10/lb for low earth orbit missions. This value contributes \$25 per kilowatt of system capital cost. (Author)

A73-38408 * # Development of a lightweight body-mounted solar cell array with a high power to weight ratio. H. Somberg (Textron, Inc., Spectrolab Div., Sylmar, Calif.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 338-340. 7 refs. Research supported by Textron, Inc. and NASA.

Three lightweight solar cell arrays have been fabricated with a high power-to-weight ratio. These arrays incorporate resistance welded interconnections, improved antireflection coating on the solar cell and lightweight substrates. Two of the substrates were constructed of magnesium with different structural geometry, while the third substrate was conventional aluminum honeycomb. All arrays utilized thin solar cells having a titanium-palladium-silver contact system and an antireflection coating of titanium oxide. The cells were welded with silver plated molybdenum interconnections. The two arrays having magnesium substrates exhibited a power/weight of 70.4 W/kg (32 W/lb.) and 81 W/kg (36.8 W/lb.), while the conventional array demonstrated a power/weight of 45.2 W/kg (20.6 W/lb.). (Author)

A73-38409 # An analysis of linear focused collectors for solar power. R. B. Pope and W. P. Schimmel, Jr. (Sandia Laboratories, Albuquerque, N. Mex.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 353-359. 6 refs. AEC-supported research.

The use of linear focused collectors to collect solar energy in a high-quality (high-temperature) state is analytically studied. The effects of variations in concentration, absorptance, and emittance of the receiver, silvering of the envelope, and system geometry are considered. Convective and radiative transport between the receiver and envelope and from the envelope to the environment are modeled. Radiative exchange processes are modeled with an approximate two-wavelength band model. Calculated results are presented for varying values of specular solar input, linear aperture, concentration, absorptance, emittance, collection temperatures, for both silvered and unsilvered envelopes, and for both evacuated and unevacuated cavities. The study indicates that collector extraction efficiencies of 40 to 60% can be reasonably expected. (Author)

A73-38473 * A solar engine using the thermal expansion of metals. R. Beam and J. Jedlicka (NASA, Ames Research Center, Structural Dynamics Branch, Moffett Field, Calif.). *Solar Energy*, vol. 15, July 1973, p. 133-142. 5 refs.

A thermal engine which uses solid metal as the single-phase working substance to convert solar energy into small amounts of mechanical energy is described. Test data are given for an engine whose working substance was annealed 304-type steel welded into a

thin-walled tube that was mounted in a bearing at each end (making it free to rotate about its axis) with a flywheel mass at its midpoint. When heated on its upper surface, the tube rotates producing steady power. The theory of the engine is outlined. V.P.

A73-39247 # Solar power via satellite. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.). *Astronautics and Aeronautics*, vol. 11, Aug. 1973, p. 60-68. 29 refs.

The satellite solar power station (SSPS) concept is described and shown to represent a major challenge to engineering and an unparalleled opportunity to apply space technology for the benefit of mankind. Its feasibility is contingent upon no fundamental breakthroughs. Whether it is worth being realized is shown to depend upon criteria of comparative cost, resource conservation, or environmental enhancement that may vary in the future as technology developments provide new energy production alternatives. It is felt that the necessary steps to protect the SSPS option should be taken in the meantime. M.V.E.

N68-12252 * # Radio Corp. of America, Lancaster, Pa. **SOLAR THERMOELECTRIC GENERATOR DESIGN AND PANEL DEVELOPMENT PROGRAM**

V. Raag, R. E. Berlin, and L. H. Gnaul 20 Dec. 1967 122 p refs

(Contract NAS3-10600)

(NASA-CR-72340; RCA-647DR-1220) CFSTI: HC \$3.00/MF \$0.65 CSCL 10B

A silicon-germanium solar thermoelectric generator has been designed for operation at a distance of 0.25 AU from the sun. The generator delivers 150 watts of electrical power at a nominal load voltage of 28 volts; produces 36.4 watts per square foot of generator area; and weighs 3.23 pounds per square foot. The design and analysis of both thermoelectric and mechanical performances of this generator are considered in detail. Engineering layout drawings of the generator and its components are also presented. Author

N68-14185 * Electro-Optical Systems, Inc., Pasadena, Calif. **PLANETARY SOLAR ARRAY DEVELOPMENT Quarterly Report**

R. Wizenick 6 Jan. 1968 73 p Prepared for JPL

(Contracts NAS7-100; JPL-952035)

(NASA-CR-91730; EOS-7254-Q-2) CFSTI: \$3.00 CSCL 10A

Conceptual designs of photovoltaic solar arrays capable of producing 200 watts of raw electrical power on the Martian surface at solar noon are described. The following four concepts are evaluated: (1) deployable fixed array; (2) two axis, two panel array mounted from two opposing sides of the spacecraft with one common horizontal boom; (3) two axis, one panel array mounted on a single vertical boom together with the antenna; and (4) two axis two panel array mounted on a single vertical boom together with the antenna. Conceptual drawings of the candidate arrays are included. Solar circuit design, substrate design, and materials studies which provided a common basis for the concepts chosen for detail design studies are also examined. S.C.W.

N68-15766 * Thermo Electron Engineering Corp., Waltham, Mass. **SIX-CONVERTER SOLAR THERMIONIC GENERATOR (JG-4) Quarterly Progress Report, 1 Jul.-15 Dec. 1967**

P. K. Shesliek, T. Athanis, and L. Lazaridis 15 Dec. 1967 57 p ref Prepared for JPL

(Contracts NAS7-100; JPL-951770)

(NASA-CR-92586; TE-4073-70-68; QPR-2) CFSTI: \$3.00 CSCL 10A

This work involves the design and fabrication of a Six-Converter Solar Thermionic Generator designated JG-4. During this reporting period the complete design was finalized, six converters were

fabricated and tested, and all generator components were fabricated. Also, the components for six other converters have been fabricated and processed. Author

N68-16074* Thermo Electron Engineering Corp., Waltham, Mass.
SOLAR THERMIONIC GENERATOR DEVELOPMENT
 Quarterly Report, 1 Sep.-30 Nov. 1967

Dec. 1967 45 p Prepared for JPL
 Contracts NAS7-100; JPL-951263)
 NASA-CR-92520; TE-4055-83-68; QR-8) CFSTI: \$3.00 CSCL 10A

Progress is reported in the development of a solar thermionic generator. Areas discussed include (1) testing of converter T-207 using the S-type of filament as the electron bombardment source, (2) fabrication of converter T-208, and (3) selection of a multiconverter generator configuration and calculation of its electrical performance for earth test and cislunar operation. Detailed test results are shown in both graphical and tabular form. C.T.C.

N68-16695* National Aeronautics and Space Administration,
 Lewis Research Center, Cleveland, Ohio.

DESIGN AND PERFORMANCE OF TWO VACUUM CHAMBERS AND SOLAR SIMULATORS FOR SOLAR-CELL RESEARCH

Dolph C. Spagnuolo Washington Feb. 1968 18 p refs
 NASA-TM-X-1503) CFSTI: HC\$3.00/MF\$0.65 CSCL 14B

A facility containing a 5-foot- (1.52-m-) and a 2-foot- (0.61-m-) diameter space-environmental chamber with two solar-radiation simulators and support equipment is described. The facility is designed for testing solar cells, thermoelectric and thermionic devices, and related components at vacuum levels in the 10^{-8} - to 10^{-9} -torr (10^{-8} to 10^{-7} -N/m²) range. The pumping systems and liquid-nitrogen-cooled shrouds are described. Information concerning a test apparatus and a solar-cell installation method is also included. Author

N68-16882* Radio Corp. of America, Princeton, N. J. Astro
 Electronics Div.

REVIEW AND EVALUATION OF PAST SOLAR CELL DEVELOPMENT EFFORTS Semiannual Report, Jun. 1-Nov. 30, 1967

A. A. Crossley, G. T. Noel, and M. Wolf Dec. 1967 225 p refs

Contract NASw-1427)
 NASA-CR-92679) CFSTI: HC\$3.00/MF\$0.65 CSCL 10A

During this period, the literature search and abstraction have been continued to fill gaps in the literature previously obtained, and to keep up with new publications. The coverage of this search is now all but complete, and such gaps as are known to exist are detailed, and the efforts made to cover these are described. A bibliography lists those papers and reports which have been read and abstracted during the reporting period. The main body of this report is a historical review of the scientific work performed on photovoltaic effects, and the development done on energy conversion devices using this effect, covering the period from 1940 to the present time. Author

N68-17795 Pennsylvania Univ., Philadelphia.

SOLAR COLLECTION LIMITATIONS FOR DYNAMIC CONVERTERS

George L. Schrenk /in AGARD Combust. and Propulsion 1967 p 25-46 refs

A mathematical model for analysis of actual solar collectors has been developed. This model allows one to calculate the energy flux on any arbitrarily shaped focal surface from any arbitrarily shaped collector surface without making numerical approximations. Provisions are included for treating random surface errors on the reflector surface, orientation errors of any size, and vignetting of reflected light by a cavity opening. Typical results from this model

are presented to show the effects of surface and orientation errors. This model has recently been used to investigate the interface between the collector and the heat receiver—the cavity opening. The directional assumption ordinarily made for this interface is that this opening can be treated as if it were a plane surface that emitted radiation according to Lambert's law (i.e., the cosine law). Results are presented that clearly show that this assumption is in substantial error for both perfect and imperfect collectors. Detailed analytical work has been performed on cylindrical heat receivers coupled with typical collectors. An "open cavity" Fredholm integral equation approach and the valid directional distribution have been utilized. The effects of the absorptivity and emissivity of the walls of the heat receiver have been investigated; reradiation losses and system performance have been calculated. The results presented differ significantly from the usual engineering estimates used in the design of solar power systems. Author

N68-17804 Centre National de la Recherche Scientifique, Paris (France).

LIMITATIONS OF SOLAR COLLECTORS FOR CONVERTERS [LIMITATIONS DES COLLECTEURS SOLAIRES POUR CONVERTISSEURS]

F. Trombe and E. Le Grives /in AGARD Combust. and Propulsion 1967 p 279-314 refs Prepared jointly with Office Natl. d'Etudes et de Rech. Aérospatiales, Paris

Research on solar energy collectors and receivers for space applications. Review of various concentrator concepts and definition of receiver configurations leading to most promising performances. Analysis of main factors affecting efficiency (geometrical perfection, optical qualities, structural rigidity, response to meteorite impacts, etc.), and receiver efficiency (absorption characteristics, surface radiation...) Author

N68-18466* European Space Technology Center, Noordwijk (Netherlands).

SATELLITE POWER-CONDITIONING AND CONTROL: A SUMMARY OF DESIGN POSSIBILITIES

A. W. Preukschat Paris ESRO Oct. 1967 21 p
 (ESRO-TM-54(ESTEC)) CFSTI: HC\$3.00/MF\$0.65

This paper deals with the power conditioning and control system of a solar cell array—battery power supply for satellites. Following a functional description, the general requirements and features of possible subsystems are discussed. Author (ESRO)

N68-18998* National Aeronautics and Space Administration,
 Lewis Research Center, Cleveland, Ohio.

ANALYSIS OF THE MAXIMUM PERFORMANCE OF A PARABOLOIDAL SOLAR COLLECTION SYSTEM FOR SPACE POWER

Gabriel N. Kaykaty Washington Mar. 1968 19 p refs
 (NASA-TN-D-4415) CFSTI: HC\$3.00/MF\$0.65 CSCL 10B

An analytical study was performed to investigate the effects and interactions of the concentrator surface errors and rim angle, collection system orientation error, and cavity receiver operating temperature on the maximum thermal efficiency of a paraboloid collection system operating in the vicinity of the earth. The ranges investigated were: standard deviation of surface error (0 to 18 min), orientation error (0 to 30 min), receiver temperature (2000° to 4000°R or 1110° to 2200°K), and concentrator rim angle (45 to 60 deg). Results indicate that the surface error, orientation error, and receiver operating temperature each decidedly affect the collection efficiency and that these effects are interdependent. It is shown that surface and orientation error became increasingly important with increasing receiver operating temperature. A variation in rim angle, on the other hand, produces only a slight variation in collection efficiency and does not materially modify the effects of the other three parameters. This information can be applied to the more comprehensive design optimization of a solar power system with regard to such factors as weight, size, and manufacturing simplicity. Author

02 SOLAR ENERGY

N68-19128*# National Aeronautics and Space Administration, Washington, D. C.

ELECTRIC POWER GENERATION IN SPACE

Dec. 1967 20 p

(NASA Facts-NF-38) GPO: HC \$0.20; CFSTI: MF \$0.65 CSCL 10B

This educational facts pamphlet presents a comprehensive account of present and future electric power sources for space application. Covered are requirements and constraints of electric power generation in space, solar energy conversion, construction and functioning of solar cells, rechargeable batteries, fuel cells, thermoelectric and thermionic power plants and converters, the Brayton and Rankine cycles, and several Systems for Nuclear Auxiliary Power (SNAP) concepts.

K.W.

N68-21879*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

FEASIBILITY STUDY OF A 30 WATTS PER POUND ROLL UP SOLAR ARRAY Quarterly Technical Report, 1 Jan.-31 Mar. 1968

N. F. Shepard, K. F. Merten, and F. A. Blake 15 Apr. 1968 138 p refs Prepared for JPL

(Contracts NAS7-100; JPL-951970)

(NASA-CR-94243; Doc. 68SD4246; QTR-3) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A --

Activities for establishing the feasibility of a 30 watts per pound roll-up solar array are reported. Included are the complete definition of a model to demonstrate the deployability of the selected flight array configuration, thermal cycling tests of a 5-cell by 5-cell module, and factors affecting the array blanket edge curling phenomenon.

Author

N68-22010# Bolkow Entwicklungen K. G., Munich (West Germany).

DEVELOPMENT OF ADVANCED SOLAR CELL MODULE TECHNOLOGY FOR USE BY SOLAR PROBES AND LARGE AREA SOLAR CELL ARRAYS [ENTWICKLUNG VON FORTSCHRITTLICHEN SOLARZELLEN MODULTECHNOLOGIEN UNTER BERUECKSICHTIGUNG VON ANWENDUNGEN BEI SONNENSONDEN UND GROSSFLAECHEGIGEN SOLARZELLENANLAGEN]

Egon Mueller, Edgar Klippel, and Klaus Einfeld 1968 54 p refs In GERMAN Presented at the 2nd DGLR Symp. on Energy Supply in Interstellar Space, Munich, Mar. 1968 Supported in part by the Bundesmin. fuer Wiss. Forsch.

(RF-93-0; DGLR-68-003) CFSTI: HC \$3.00/MF \$0.65

A largely mechanized module technique for the fabrication of solar cells is described which specifically provides for resistance to thermal shock and thermal cycles. Mechanization of soldering and bonding makes this method especially suited for large-volume production. Silver lattice-foil structures joined by brazing are used for greater structural stability and to keep weight low. Air packets and inclusions on bonded surfaces are avoided by bonding in vacuum.

Transl. by K.W.

N68-22258*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Hampton, Va.

THE GEOMETRIC PROPERTIES OF AN EXPANDABLE WHIRLING-MEMBRANE SOLAR-ENERGY CONCENTRATOR

John M. Jerke and Atwood R. Heath, Jr. Washington May 1968 36 p refs

(NASA-TN-D-4532) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

The whirling-membrane concept of solar-concentrator fabrication has been proposed for use with spacecraft-power-conversion devices because of its compact-packaging potential. Three membranes of 0.01-millimeter-thick aluminized plastic were constructed and attached to metal hubs for which the ratios of the hub radius to the membrane radius were 0.20, 0.35, and 0.50. The resulting models that had design focal lengths of 132.1 centimeters and

design diameters of 3.05 meters were rotated at 71 radians per second in a vacuum chamber at pressures below 133 newtons per meter². The accuracy with which each membrane achieved the design paraboloidal shape was measured by an optical-ray-trace technique. The membrane with the metal hub of largest diameter gave the best concentration of energy. For this model, the focal length was 130.5 centimeters or 1 percent less than the design value. A geometric efficiency of 1.00 was obtained at concentration ratio of 23. Membrane surface mean errors varied from -0.6° to 0.4° in the radial direction and were essentially zero in the circumferential direction. The random error has a standard deviation of 0.5° in the radial direction over most of the membrane and 0.25° in the circumferential direction. Location of support cables relative to the metal hub was found to be an important factor in the design of a whirling-membrane concentrator.

Author

N68-22401*# National Aeronautics and Space Administration, Washington, D. C.

INVESTIGATION OF THE THERMAL STABILITY OF THE MICROSURFACE OF ASTRONOMICAL MIRROR: FABRICATED FROM AMg6L ALLOY WITH CHROMIUM AND NICKEL COATINGS [ISSLEDOVANIYE NA TERMOSTOIKOST' MIKROPOVERKHNOSTI ASTRONOMICHESKIKH ZERKAL IZGOTOVLENNYKH IZ SPLAVA AMg6L S KHROMOVYMI I NIKEL'EVYMI POKRYTIYAMI]

Zh. M. Loresyan Apr. 1968 4 p Transl. into ENGLISH from Soobshch. Byurakansk. Observ., Akad. Nauk, ARM. SSR (Erevan), no. 38, 1967 p 66-71

(NASA-TT-F-11659) CFSTI: HC \$3.00/MF \$0.65 CSCL 11F

An experimental study was performed to determine the effects of low and high temperatures and differences in the linear expansion coefficient of the aluminum alloy AMg6L and electrolytic chromium or chemical nickel coatings on the microsurface quality of astronomical mirrors. Coatings of various thicknesses were tested at -95, +20, +60, and +100°C. Temperature variations had no effect on nickel films, but cracks appeared on the surface of chromium coatings thicker than 50 μ.

Author

N68-22991*# Thermo Electron Engineering Corp., Waltham, Mass. SOLAR THERMIONIC GENERATOR DEVELOPMENT Quarterly Report, 1 Dec. 1967-29 Feb. 1968

Apr. 1968 35 p Prepared for JPL

(Contracts NAS7-100; JPL-951263)

(NASA-CR-94402; TE4055-145-68; QR-9) CFSTI: HC \$3.00/MF \$0.65 CSCL 10B

During this quarter, the fabrication and test of converter T-208 have been completed. This model is the first under this program to incorporate a collector-radiator heat pipe structure. The dynamic performance of converter was almost identical to that of model T-207 in spite of a 17% reduction in collector area, but the failure of the static data to reproduce the performance data obtained dynamically has shown that the collector of converter T-208 operates at an excessive temperature. The cause of the high collector temperature is believed to be the limited area for vapor flow available at one component of the heat pipe, and it will be corrected in the construction of the following model. In addition the performance of converter T-208 was relatively low, and cesium conduction tests revealed an unusually large spacing of about 4 mils; steps will be taken to improve the positioning of parts during assembly of T-209.

Author

N68-23182*# National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.

POWER GENERATION AND CRYOGENIC GAS STORAGE SYSTEMS STUDY FOR POST AAP 1-4 MANNED MISSIONS

Tony E. Redding, ed. 3 Aug. 1967 54 p

(NASA-TM-X-61072, MSC-IN-67-EP-24) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

A study of possible electrical power generation systems (PGS) and cryogenic gas storage systems (CGSS) for the Apollo

Applications (AAP) missions is summarized. Ground rules and guidelines affecting PGS and CGSS requirements were investigated, and attention was given to missions and configurations, power, and CGSS requirements as well as weights and payload margins. Candidate hardware were studied for the cryogenic gas storage systems, fuel cells, solar cell/battery systems, primary and secondary batteries, and power conditioning. Design and analysis for the PGS and CGSS included hybrid power system, command-service module fuel cell/radiator heat rejection system, and orbital storage considerations. Scheduling, costs, and programming considerations are summarized. M.W.R.

N68-23528* Radio Corp. of America, Princeton, N. J. Astro Electronics Div.

MULTI-KILOWATT SOLAR CELL POWER: ITS CRITICAL TECHNOLOGY AND HARDWARE DEVELOPMENT

[1967] 117 p. Transcript of Presentation at NASA Headquarters, Washington, D. C., 13 Jul. 1967. Sponsored by NASA (NASA-CR-94551) CFSTI: HC\$3.00/MF\$0.65 CSCL 10A

A program review is presented on the critical areas of technology associated with solar cell battery power systems for manned spacecraft. The technical details of what comprises a typical large manned mission solar power system are discussed, and some of the technical problems of large solar cell development are defined. They include (1) adaptability of design approach to orbits, (2) one year reliability goal of 0.995, (3) solar cell constrained to operate belly down, (4) in-orbit thrusting for orbit plane, and (5) flight vehicle envelope constraints. Pictorials and charts are given to graphically illustrate various topics discussed which include system configuration analysis, baseline system analyses, reliability enhancement of baseline system analysis, and selected system configurations. The overall development program for solar cell arrays is examined in relation to total cost of solar array development, development tasks, and the hardware and major elements of the array. B.S.D.

N68-23987* Hittman Associates, Inc., Baltimore, Md.

SOLAR FLAT PLATE Final Report

Oct. 1966 224 p refs

(Contract NAS5-9167)

(NASA-CR-94615; HIT-206) CFSTI: \$3.00 CSCL 10A

Solar thermoelectric energy conversion panels may be constructed from modules, each of which consists of an absorber, a thermoelement or thermoelectric couple, and a radiator. The absorber collects solar heat which causes a high temperature to be established. The thermoelements convert a portion of this heat to electricity, and the unconverted heat is rejected to space by the radiator. An accurate analysis has been developed, reported herein, so that the performance characteristics of the solar flat plate may be predicted for expected operational conditions. The mathematical model obtained as a result of this study contains a number of non-linear second order differential equations which cannot be solved analytically. A digital computer program therefore has been written for the IBM-7094 so that a solution may be obtained. Major emphasis has been placed in the writing of the program so that calculation accuracy and ease of use of the program will result. A comparison of the computer program results with experimental and manual calculations show good correlation. A limited parametric study has been performed and reported herein which shows characteristics to be expected for earth orbit behavior and for an application close to the sun. Author

N68-27564* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

PERFORMANCE OF AN EXPANDABLE WHIRLING MEMBRANE SOLAR ENERGY CONCENTRATOR

John M. Jerke [1967] 16 p refs. Presented at the 3d Aerospace Expandable and Modular Struct. Conf., Miami Beach, Fla., 16-18 May 1967

(NASA-TM-X-59872) CFSTI: HC\$3.00/MF\$0.65 CSCL 10A

The whirling membrane solar energy concentrator is a preformed approximate paraboloid constructed of an aluminized plastic film which is attached to a fixed hub. The concentrator is deployed by rotation about the optical axis, and the membrane assumes the desired paraboloidal shape under the stresses imposed by centrifugal and axial loading. The concentrating ability of three whirling membrane models was determined by optical ray trace methods and the results of the investigation are presented. Dispersion of the reflected optical image in the focal plane occurred for all three models. This undesirable energy spread probably resulted from circumferential wrinkles and a deviation in the circular shape of the membrane similar to cusping or scalloping. Comparison of data for the models shows that the two larger hub models developed considerably less circumferential wrinkling than the smallest hub model. A parabolic radial cross section was generally attained for each model, but with focal distances slightly less than the design value. Estimation of the geometric efficiency indicates that the whirling membrane concentrator is applicable for relatively low-temperature space power conversion systems. Author

N68-27643* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

REVIEW OF SOLAR CONCENTRATOR TECHNOLOGY

Atwood R. Heath, Jr. and Edward L. Hoffman [1967] 19 p refs. Presented at the Intersoc. Energy Conversion Eng. Conf., Los Angeles, 26-28 Sep. 1966

(NASA-TM-X-59043) CFSTI: HC\$3.00/MF\$0.65 CSCL 10A

Continuing development of solar concentrator technology has been directed toward the improvement of methods and materials of construction to satisfy the particular design requirements of various space power conversion devices. Descriptions of fabrication techniques as well as a brief discussion of recent results from investigations made on concentrators are presented. In the area of one-piece concentrators, the stretch-formed aluminum process has been developed to the point where concentrator accuracy compares favorably with the high quality formerly obtained only by electroforming nickel. The aluminum electroforming process has been scaled up to the point where 0.76-meter-diameter concentrators have been fabricated. In the area of expandable concentrators, a modified model of the whirling membrane concept has given improved concentration of energy, however, the design parabolic cross section has not been attained. Author

N68-27926* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

PERFORMANCE OF AN EXPANDABLE WHIRLING MEMBRANE SOLAR ENERGY CONCENTRATOR

John M. Jerke. In AFSC Expandable and Modular Struct. Conf. May 1967 p 167-180

(L-5484)

Results of a program to investigate the whirling membrane solar concentrator concept are presented. An optical ray trace method was employed to estimate such concentrator properties as shape, focal length, and geometric efficiency. Three 3.05-m diameter models with ratios of hub diameter to concentrator diameter of 0.20, 0.35, and 0.50 were examined and results are given for each model. All models generally achieved a parabolic radial cross section, but with focal lengths of 130.7 centimeters, 129.1 centimeters, and 128.2 centimeters for the 0.20, 0.35, and 0.50 hub models, respectively. Comparison of the data for the three models shows that there was considerably less circumferential wrinkling in the 0.35 and 0.50 hub models, which were similar in behavior, than in the 0.20 hub model. Estimation of the geometric efficiency at various aperture ratios for the 0.50 hub model indicated that the whirling membrane has a concentrating ability comparable to two other expandable-type solar concentrators, and inflatable-rigidized and split-rib umbrella, which also use an aluminized plastic membrane. The whirling membrane appears to be capable of efficient operation (greater than 0.90) in the aperture ratio range near 0.04 which would make it applicable for relatively low temperature space power conversion systems. Author

02 SOLAR ENERGY

N68-27974* TRW Systems Group, Redondo Beach, Calif.
MARINER MARS POWER SYSTEM OPTIMIZATION STUDY
Interim Report, 4 Mar.-31 May 1968
F. S. Osugi May 1968 41 p Prepared for JPL
(Contracts NAS7-100; JPL-952151)
(NASA-CR-95263; TRW-E-7443-3-024) CFSTI: HC \$3.00/MF \$0.65 CSCL 22B

The prime objective of the study is directed toward the development of an optimum Mariner-class spacecraft power system to provide improved utilization of solar array capacity and greater reliability than the present Mariner-Mars power system. The two missions identified for this study project are a Mars flyby and a Mars orbiter.

Author

N68-28740# Ferranti, Ltd., Chadderton (England).
DEVELOPMENT STATUS OF SOLAR GENERATORS BASED ON SILICON PHOTO-VOLTAIC CELLS

O. Clive Butcher, Derek Bassett, and Harold George Webb /n AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 829-867 refs

Design techniques for silicon solar cells, including junction, contacts, optics, and encapsulation parameters, are discussed. The performance of cells for both terrestrial and space applications is related to the operating environment. There are no known degradation mechanisms applicable to terrestrial installations. Test results show the effects of charged particle bombardment of space cells and emphasize the significance of this factor in generator design. Methods of mounting solar cells in space application are examined, using the ESRO 2 satellite as an example. More recent techniques show weight, area, and cost advantages.

Author

N68-28741# Royal Aircraft Establishment, Farnborough (England). Space Dept.

RECENT DEVELOPMENTS IN SILICON SOLAR CELLS
Frederick Christopher Treble /n AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 868-901 refs

State-of-the-art silicon solar cells and panel assembly are described, and the specific weight, area and cost of a typical array are estimated. Radiation damage and temperature dependence data are presented. Developments aimed at improving these parameters are reviewed, particular reference being made to the possibility of achieving a considerable reduction in specific weight by mounting very thin single crystal cells on flexible or semiflexible substrates. Experiments in this field are described and a forecast made of the specific weight and area of a flexible array of 0.004 in. cells. Work on cover slips and cements, which may lead to a reduction of cost, is discussed.

Author

N68-28744# Centre National de la Recherche Scientifique, Bellevue (France). Laboratoire de Magnetisme et de Physique de Solides.

CADMIUM TELLURIDE SOLAR PHOTOCELLS [LES PHOTOPILES SOLAIRES AU TELLURE DE CADMIUM]
Michel Rodot /n AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 944-1009 refs In FRENCH and ENGLISH

After a brief historical survey, the technology used to prepare photoelectric cells in thin layers of CdTe having 5% conversion efficiency is described. For the purpose of foreseeing possible improvements, the intrinsic properties of CdTe, the thermodynamic and electronic properties of the currently known imperfections, and an analysis of the mechanism of the photovoltaic effect in CdTe-Cu₂Te junctions are presented. The present performance of these cells is given, with special attention directed to the status of studies dealing with degradation by heating or irradiation. Finally, difficulties in the way of increasing the efficiency to approximately 8% obtained from single crystals and of improving the overall performance are discussed.

Author

N68-28745# Allgemeine Elektrizitaets-Gesellschaft, Hamburg (West Germany).

OPTICAL AND TECHNOLOGICAL PROBLEMS OF SOLAR CELL GENERATORS

Helmuth H. Menke and Joachim Rath /n AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 1011-1020 (See N68-28714 17-03)

Details are given on the more important test methods used to determine the physical properties of such main components of solar cell generators as the solar cells, cover slides, and adhesives to cement the cover slides to the solar cells. As the tests must be conducted under simulated space environment conditions, the main facilities are listed as solar simulator, vacuum chamber, temperature chamber, and Van de Graaff generator. Photoelectrical measurement techniques are also described. The application of the test data to solar generator design is discussed.

M.G.J.

N68-28746# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

GERMANIUM SOLAR PHOTOELECTRIC CELLS. 1: EXPERIMENTAL STUDY OF PHOTOVOLTAIC CELLS AT HIGH FLUX DENSITIES

Jean Tavernier and Paul Sibillot /n AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 1071-1085 refs

Germanium solar cells are shown to be well suited for high intensity solar conversion devices. Preliminary experiments have been performed up to 20 W cm⁻² power density, and a conversion efficiency more than twice that of silicon cells was obtained.

Author

N68-30761* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

PRELIMINARY ANALYSIS OF A TITANIUM ALLOY HONEYCOMB SOLAR ABSORBER HAVING BLACKENED WALLS

William J. Bifano Washington Aug. 1968 27 p refs
(NASA-TN-D-4727) CFSTI: HC \$3.00/MF \$0.65 CSCL 18N

A titanium alloy hexagonal honeycomb with blackened walls is considered as an absorber of collimated solar solar energy. Circular cylindrical geometry is assumed for the analysis as an approximation of the hexagonal cell structure. The apparent hemispherical emittance of such an absorber positioned over a black surface is calculated. Results are presented for cell length-to-diameter ratios of from 1 to 7 and cell diameters of 0.25, 0.5, and 1.0 in. (0.635, 1.27, and 2.54 cm, respectively). The collimated incident solar flux is assumed sufficient to attain base surface temperatures of 1860° and 2060° R (1033 and 1144 K). The corresponding weight per unit area of such an absorber is also calculated.

Author

N68-31018* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

FLAT PLATE THERMOELECTRIC GENERATORS FOR SOLAR PROBE MISSIONS

Valvo Raag, Robert E. Berlin, and William J. Bifano Washington 1968 12 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., Boulder, Colo., 13-16 Aug. 1968
(NASA-TM-X-52451) CFSTI: HC \$3.00/MF \$0.65 CSCL 10B

The design of a flat-plate thermoelectric generator for operation at 0.25 AU or less from the sun is presented. Design output is 150 watts at 28 volts. Generator electrical performance, temperature profiles, and component weights are included. Layout drawings illustrate the generator configuration. The operations of the generator under a variety of off-design conditions, in terms of variable absorptance and emittance characteristics of generator surfaces and its operating distance from the sun, is discussed.

Author

N68-31096* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

2 TO 10 KILOWATT SOLAR OR RADIOISOTOPE BRAYTON POWER SYSTEM

John L. Klann Washington 1968 14 p refs Presented at the IEEE Intersoc. Energy Conversion Eng. Conf., Boulder, Colo., 14-16 Aug. 1968

(NASA-TM-X-52438) CFSTI: HC \$3.00/MF \$0.65 CSCL 10B

A second generation Brayton power system has been defined. Hardware components are currently being assembled for complete, ground-based power system tests. The power systems to be tested are described. Maximum system efficiency is estimated at 0.19 for two kilowatts of output, rising to about 0.27 in the range from six to ten kilowatts.

Author.

N68-31404* Boeing Co., Seattle, Wash. Space Div.

LARGE AREA SOLAR ARRAY Quarterly Report—Phase 2, 1 Mar.-31 May 1968

R. C. Weikel, F. W. McAfee, J. L. Apperson, and Dwight A. Norsen Jun. 1968 252 p refs Prepared for JPL

(Contracts NAS7-100; JPL-951934)

(NASA-CR-95999; D2-113355-6, Pt. U; QR-3) CFSTI: HC \$3.00/MF \$0.65 CSCL 13H

Following a summary of engineering, technology, and manufacturing activities relating to the development of a large area solar array, details are presented of the various aspects of the development program. Design and requirements are stated, and the effect of boost environment on design is detailed. The latter includes the dynamic and internal loads for stowed configurations, vibration and stress-deformation analyses, the prestress conditions, and temperature distribution and temperature control aspects. Both ground and space release and deployment are covered, and electrical power source design and performance analysis are reviewed. Attention is also given to process development and material properties, quality assurance and reliability, and weight status; and critical safety margins are summarized.

M.W.R.

N68-31526* National Aeronautics and Space Administration, Washington, D. C.

SOLAR CELLS

1968 4 p

(NASA Facts S-6/3-68) GPO: HC \$0.05; CFSTI: MF \$0.65 CSCL 10A

Described are construction and operational parameters of solar cells for electrical power generation. The solar cell uses a silicon crystal to convert sunlight directly into electrical energy and thus provides the electrical power for unmanned space missions conducted by NASA. Phosphorus-boron containing silicon crystals in a solar cell measuring only one by two centimeters can produce a current of 60 milliamperes at four-tenth of a volt.

G.G.

N68-32561* General Electric Co., Philadelphia, Pa. Missile and Space Div.

FEASIBILITY STUDY 30 WATTS PER POUND ROLL-UP SOLAR ARRAY Final Report

N. F. Shepard, F. A. Blake, W. S. Busch, A. Latour, R. J. Kyle et al 21 Jun. 1968 258 p refs Prepared for JPL

(Contracts NAS7-100; JPL-951970)

(NASA-CR-96230; Rept.-68SD4301) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

This report summarizes the preliminary design and analysis of a 250-square-foot roll-up solar array which has a power-to-weight ratio of 32.3 watts per pound. The selected array configuration is presented, along with a complete description of each component within the system. Tradeoff studies and performance analyses are presented, including dynamics, structural, electrical, and weight studies. An engineering demonstration model was designed and fabricated to demonstrate the deployability of the selected flight array. Summaries of related supporting studies and activities cover

thermal cycling tests, lubrication, materials, and preliminary design of ground support equipment.

K.W.

N68-33207* General Electric Co., Philadelphia, Pa. Missile and Space Div.

CADMIUM SULFIDE THIN FILM SOLAR CELL ARRAY SUB-PANEL DEVELOPMENT Final Report

F. A. Blake 15 Aug. 1968 28 p

(Contract NAS3-11821)

(NASA-CR-72439; DIN-68SD4299) CFSTI: \$3.00 CSCL 10A

Advancement of the art of cadmium sulfide solar array technology from the module to sub-panel (100 cells) stage was accomplished. Twelve modules of 25 cells each were fabricated using both of the previously developed interconnection methods. These were tested and assembled into three sub-panel units of four modules each. Procedures for sub-panel manufacture together with weight and performance data defining the present state of the CdS solar array technology are presented.

Author

N68-35814* Texas Instruments, Inc., Dallas.

DEVELOPMENT AND FABRICATION OF LITHIUM-DIFFUSED SILICON SOLAR CELLS Final Report, 18 Aug.-31 Jan. 1968

D. L. Kendall and R. A. Vineyard 31 Jan. 1968 46 p refs

(Contract NAS5-10274)

(NASA-CR-97077; TI-03-68-35) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

The objective of this contract is to develop lithium-diffused P-on-N silicon solar cells of high conversion efficiency which display improved resistance to the effects of space radiation. The work is based on an observation of Wysocki that solar cells made with lithium-doped silicon demonstrated spontaneous annealing at room temperature after being damaged with high-energy electrons. The program involves the fabrication of experimental lots of silicon solar cells in which the basic parameters are varied, including base resistivity, crystal type, oxygen content, dislocation density, and lithium doping.

Author

N68-36000* TRW Systems, Redondo Beach, Calif.

STUDY TO ESTABLISH CRITERIA FOR A SOLAR CELL ARRAY FOR USE AS A PRIMARY POWER SOURCE FOR A LUNAR-BASED WATER ELECTROLYSIS SYSTEM, PHASE 1 Final Technical Report, 1 Jul. 1967-30 Jun. 1968

J. E. Boretz 30 Jun. 1968 549 p refs

(Contract NAS8-21189)

(NASA-CR-61979; TRW-09681-6002-R000) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

Parametric performance and design data were developed to assess the feasibility of using large solar array systems on the lunar surface, and to determine the compatibility of the solar arrays with the lunar environment. The candidate solar array configurations selected were the flat-skirted (shaded lunar surface), leanto-skirted, and oriented-skirted; the leanto- and oriented-skirted output power profiles were found to most closely match the load profiles for the baseline mission. Baseline mission requirements are established for setting up a lunar base for supporting lunar surface exploration activities. Trade-off studies were conducted between the lunar equipment prime electrical power system (LEPEPS) and the electrolytic reactants production system (ERPS) to arrive at the most cost-effective approach. It was concluded: (1) Both single crystal silicon cells and cadmium sulfide thin films provide adequate performance. (2) The solar array-fuel cell-ERPS system concept represents the most technologically advanced system that could be flight ready by the early 1970s. (3) The use of large solar arrays on the lunar surface is feasible; they can be made compatible with the environment by employing proper design techniques.

M.G.J.

02 SOLAR ENERGY

N68-36630* Fairchild Hiller Corp., Germantown, Md. Space and Electronics Systems Div.

FABRICATION FEASIBILITY STUDY OF A 30 WATT/POUND ROLLUP SOLAR ARRAY Final Report

W. G. King 15 Aug. 1968 114 p refs Prepared for JPL (Contracts NAS7-100; JPL-951969) (NASA-CR-97208; Rept.-652-00101-FR) CFSTI: \$3.00 CSCL 10A

The results of a study to determine the feasibility of fabricating a 250 square foot roll-up solar array capable of producing 30 watts/lb. or more of electric power are summarized. Three candidate structural systems having array deployment and retraction capability were evaluated in depth through parametric investigation of the various subsystems with weight minimization as the prime criteria. The study culminated in selection of an array panel deployment/structural support system consisting of a folding beam using programmed joint motion. A preliminary design of the selected concept is presented with results of a deployment/retraction test program conducted on a full scale mechanically functioning model.

Author

N68-37401* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. **SPACECRAFT POWER**

In its Space Programs Sum. No. 37-51, Vol. 3 30 Jun. 1968 p 29-47 refs (See N68-37397 23-11)

Spacecraft power research is reported which includes studies of: (1) solar cell standardization; solar power system definition; solar cell contacts; power subsystems applicable to the Capsule System Advanced Development project; computer programs for analyzing electronic circuits; electric propulsion power conditioning; Mars spacecraft power systems; planetary solar arrays; and thermionic converter development.

S.C.W.

N69-10227* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRANSIENT SOLIDIFICATION OUTSIDE A COOLED PIPE WITH APPLICATION TO A SOLAR BRAYTON HEAT RECEIVER

Wellington W. Hu Washington Nov. 1968 33 p refs (NASA-TN-D-4897) Avail: CFSTI CSCL 20M

The analysis involves time-variant heat conduction with the liquid-solid boundary moving radially through the axisymmetric heat-storage material as heat is transferred to the flowing cooling medium. Solutions were obtained by simultaneously solving the integrated nonlinear differential equations through numerical means. Quasi-steady radial heat conduction is utilized at an instant of time. Solutions for wall temperature, gas temperature, and solidification thickness along the tube for a 35-minute shadow portion of an Earth orbit are obtained for a solar Brayton heat receiver. A simplified solution neglecting the wall-temperature variation is also derived to compare with the numerical method.

Author

N69-10708* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

CALORIMETRIC, OPTICAL, AND VIBRATION INVESTIGATIONS OF STRETCH-FORMED ALUMINUM SOLAR CONCENTRATORS

Marvin D. Rhodes and Conrad M. Willis Washington Nov. 1968 45 p refs (NASA-TN-D-4889) Avail: CFSTI CSCL 10B

Three stretch-formed aluminum solar concentrators were evaluated. The models represent three phases of a program; all were 1.52-m-diam paraboloids with a nominal rim angle of $\pi/3$ rad. Calorimetric tests were made on each model to determine the improvement in model performance caused by changes in model design and fabrication. Model 3 was superior to the other models in both geometrical accuracy and specular reflectance and is considered suitable for thermionic applications. Optical-ray-trace tests were performed on models 1 and 2 to determine the magnitude

and location of surface slope errors. The largest slope errors occurred near the gore seams but the region of high error was only about 8% of the total area. Ray-trace data were also used to calculate geometric efficiency by three methods. Only the random error method gave reasonable results for both models. Vibration tests on model 1 caused failure in the welds of the rim support ring structure, but subsequent calorimetric tests revealed little or no reduction in concentrator efficiency.

Author

N69-11991 Bolkow Entwicklungen K. G., Munich (West Germany).

SOLAR CELLS AND THEIR APPLICATION TO SPACE TRAVELING [SOLARARZELLEN UND IHRE ANWENDUNG IN DER RAUMFAHRT]

Egon Mueller 26 Jul. 1968 80 p refs In GERMAN Presented at the 7th Symp. on Space Traveling, Brunswick, 7-12 Oct. 1968 (RF-89-0) Avail: Issuing Activity

The principle, production, and efficiency of semiconductor solar cells are described, and the properties of silicon solar cells are analyzed. Problems in connection with the dimensioning and the aggregation of modules are discussed, including spectral sensitivity, temperature effects, electrical connections, and coating materials. Factors of weight, reliability, exposure to radiation, and temperature control are considered. Performance data and configurations of representative systems are given, and tendencies of future development are discussed.

Transl. by K.W.

N69-14920* Thermo Electron Engineering Corp., Waltham, Mass.

SIX-CONVERTER SOLAR THERMIONIC GENERATOR Final Report, 10 Jan. 1967-31 Mar. 1968

T. Athanis, P. Shefsiek, and L. Lazaridis Jun. 1968 110 p refs Prepared for JPL

(Contracts NAS7-100; JPL-951770) (NASA-CR-98712; TE4073-146-68) Avail: CFSTI CSCL 10B

A six-converter solar thermionic generator was designed, fabricated and subjected to preliminary evaluation. Six additional thermionic converters similar to those used in the generator were fabricated and individually tested. With the exception of one, each of the twelve converters produced more than 36 watts of output power at 0.7 volt output voltage, and at 2000°K emitter temperature. The average power output per converter was 37.5 watts. All converters have identical overall configuration, employing planar electrode geometry with a rhenium emitter (of about 2 cm² area), and a molybdenum collector separated by about 0.005 cm (2 mils) during operation. Critical parts of each converter and of the generator in general were subjected to detailed design analysis and performance evaluation. Heat flux distribution and temperature profiles, heat transfer mechanisms, and heat dissipation requirements in the generator were determined.

Author

N69-15891* European Space Technology Center, Noordwijk (Netherlands). Large Astronomical Div.

LARGE ASTRONOMICAL SATELLITE SOLAR PADDLE CONFIGURATIONS AND AVAILABLE POWER

R. Somoza Paris ESRO Sep. 1964 20 p (ESRO-TM-P-5(ESTEC)) Avail: CFSTI

A choice having been made regarding the location of the proposed four solar paddles i.e. attached to the structure around the gymbal for the stable platform so as to obtain the projection of a significant area on the plane normal to the sun's rays and to minimize the problem of occultation of reference stars, nine possible shapes are discussed. The average projected areas as a function of the direction of the solar rays are measured and an estimate made of the average power generated for each solar paddle configuration. The advantages and disadvantages of the different shapes are compared and a recommendation made as to the most suitable type.

ESRO

N69-16975* Melpar, Inc., Falls Church, Va.
THE DESIGN AND DEVELOPMENT OF A LOW TEMPERATURE BALLOON BATTERY Phase 1 Final Report, 22 May-5 Aug. 1968
 5 Aug. 1968 38 p refs
 (Contract NAS5-11557)
 (NASA-CR-73711) Avail: CFSTI CSCL 10C

Solar energy transmission measurements of various plastic films used as solar energy collecting arrays are investigated. Heat losses were estimated and a design was evolved, serving as solar energy transmitting and heat insulating array. This array or enclosure was tested using several solar thermal storage materials of the heat of fusion type. The battery temperature was stabilized in the presence of solar heat during the daytime, using the stored heat during nights. An array of 8 air-spaced Teflon FEP film transmits 68% solar radiation, while its heat insulating value is $U = 0.15$ or better. Heat storage materials were tested, melting around -23°C and -25°C . These have been subjected to simulated night-time tests, indicating that the desired battery temperature (-30°C) can be maintained for more than 12 hours. Compared with water-ice a volume reduction of 70% is indicated, while the weight reduction is approximately 40%. Author

N69-17227 Florida Univ., Gainesville.
A THEORETICAL INVESTIGATION AND EXPERIMENTAL VERIFICATION OF THE TWO-PHASE HEAT TRANSFER CHARACTERISTICS OF A COMBINED SOLAR COLLECTOR-GENERATOR FOR A SOLAR AIR CONDITIONER
 Gordon Lee Moore (Ph.D. Thesis) 1967 115 p
 Avail: Univ. Microfilms: HC \$5.60/Microfilm \$3.00 Order No. 68-9543

In the interest of reducing or eliminating heat loss, a theoretical study was made of the various possible configurations which could serve the dual role of both a solar collector and an ammonia generator. The theoretical analysis of the combined solar collector-generator and the results of the series of experimental investigations indicated the following advantages resulting from combining the two units into one: (1) The undesirable heat loss that occurs between solar collector and the separate generator of previous solar refrigeration systems is eliminated in the combined collector-generator. (2) The flat plate type solar collector-generator can generate substantial amounts of ammonia even on cloudy days when only diffuse solar energy is available. (3) The solar collector-generator developed can generate the equivalent of 30 pounds of ice per day with only a 4 by 4 foot collector area. (4) The combined collector-generator has a relatively short warm-up time. Dissert. Abstr.

N69-18748* TRW Systems Group, Redondo Beach, Calif.
STUDY AND ANALYSIS OF SATELLITE POWER SYSTEMS CONFIGURATIONS FOR MAXIMUM UTILIZATION OF POWER, PHASE 2 Technical Report, 12 Sep. 1966-31 Dec. 1968
 31 Dec. 1968 139 p refs (Contract NAS5-9178)
 (NASA-CR-100038; TRW-04898-H001-RO-00) Avail: CFSTI CSCL 22B

The computer program for evaluating electric power system designs, as developed in Phase 1 of the study, was fully implemented on the IBM 7094 computer. Results of the implementation for EPSOM (Electric Power System Optimization Method) were within the expected $\pm 1\%$ tolerance for system efficiency. The computerization also resulted in a configuration syntheses subroutine which has proved applicable to the existing design and promises to contribute to design development of new systems and their optimization. The need to improve the reliability of satellite power systems also led in Phase I to a design for Self Regulating and Protecting (SRAP) power systems, for which the present phase of the study provided a broad spectrum of

failure modes analyses. These began at the component level and progressed through the circuit and equipment levels to the power system. All detection methods studied required a significant reaction time, in order to identify a potential failure and to take positive corrective action to prevent it from occurring. It was concluded that some form of time delay protection is necessary in order to apply the SRAP concept to power systems, and further investigation of these devices was recommended. A.C.R.

N69-21088* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
CALORIMETRIC EVALUATION OF TWO CONE-COLUMN SOLAR-ENERGY CONCENTRATIONS
 Marvin D. Rhodes and Conrad M. Willis Washington Mar. 1969 25 p refs
 (NASA-TN-D-5109) Avail: CFSTI CSCL 10B

Two cone-column solar-energy concentrators were evaluated in this investigation. Both models had a rim angle of 0.79 radian and an effective radius of 76 cm. The first model was a simplified version of the cone-column with a rigidized cone. This model had a calorimetric efficiency of about 0.55 at an aperture radius of 8.16 solar-image radii. If this efficiency could be attained with a model utilizing a low-mass membrane cone. The cone-column would be competitive with a petalous concentrator designed for use with a Rankine cycle system. The second model was constructed to study some of the problems associated with the fabrication of an

N69-21539* Radio Corp. of America, Princeton, N. J. Astro-Electronics Div.
CONNECTOR STRIPS: POSITIVE NEGATIVE AND TABS
 Charles R. Peek and Lewis E. Boodley, inventors (to NASA) Issued 14 Jan. 1969 (Filed 21 Apr. 1966) 6 p Cl. 174-72
 (NASA-Case-xgs-01395; US-Patent-3,422,213; US-Patent-App'l-SN-545535) Avail: US Patent Office

Thins, electrically conductive connector strips for electrically and mechanically coupling a plurality of electrical elements, such as solar cells, are constructed such that the various sections thereof are joined by stress relieved areas. With particular application to the interconnection of solar cells in the formation of an array, the connectors have the ability to accommodate repeated expansion and contraction cycles and, at the same time, still maintain maximum electrical output from the array.

Official Gazette of the U.S. Patent Office

N69-22175* Radio Corp. of America, Princeton, N. J. Astro Electronics Div.
STUDY OF POWER SUPPLY CONFIGURATIONS FOR ADVANCED NIMBUS MISSIONS Final Report, 30 Apr. 1968-31 Jan. 1969
 31 Jan. 1969 167 p refs
 (Contract NAS5-11549)
 (NASA-CR-100529; R-3431) Avail: CFSTI CSCL 10B

In this study, various solar power conversion subsystems are compared and analyzed for possible application in future Nimbus missions. Maximum use was made of existing flight-qualified Nimbus hardware and techniques to configure alternate power subsystems that will supply more load power. System configurations having a load capability range of 200 to 500 W, orbit average and at beginning of life, are considered. As much as 350 W can be obtained for the entire two-year mission with the parallel part-time/full-time tracker system configuration under nominal operating conditions. Higher power systems would utilize the bifold solar array already developed on the Nimbus project. A separate peak load converter/regulator is suggested for all systems. A severe limitation was found to exist with the series tracker configuration: an orbit average power dissipation of more than 50 W would exist in this unit, which practically precludes its use in Nimbus application.

02 SOLAR ENERGY

In addition to the distinct load power increase over the Nimbus B system realized with the parallel tracker configuration, this unit requires only the same spacecraft space as the NB system. This eliminates the possible excessive power dissipation condition that could be encountered in the NB storage modules when the shunt dissipator is activated. K.W

N69-23369*# Clevite Corp., Cleveland, Ohio.

CdS SOLAR CELL DEVELOPMENT Final Report

F. A. Shirland, W. K. Bower, W. F. Dunn, and J. B. Green 14 Mar. 1969 85 p refs
(Contract NAS3-9434)

(NASA-CR-72534) Avail: CFSTI CSCL 10B

The major objectives of this second year of the program were to continue the characterization of the stability of the plastic substrate CdS thin film solar cell and to isolate and eliminate the causes of instability whenever possible. Toward that end, a standard process laboratory fabrication line was operated throughout the entire 2 year period to yield a total of 100 acceptable quality cells each month. Of these, 75 cells each month were tested and sent to the contract monitor. The remaining 25 cells were retained and placed on various dry and wet shelf storage tests, high temperature vacuum storage tests, and various temperature cycling and continuous use tests. Those cells which showed appreciable loss of output on these various tests were removed and subjected to detailed failure analyses in an effort to determine the causes of failure. Subsequently, various constructional and fabrication process variations were evaluated as possible ways around the cell weaknesses as disclosed by the various tests and analyses.

Author

N69-24137# Royal Aircraft Establishment, Farnborough (England).

THE ION ENGINE AND LARGE SOLAR ARRAY FOR THE X-5 SPACECRAFT

B. P. Day and F. C. Treble Aug. 1968 28 p refs Presented at the 1st Ann. Meeting of Brit. Intern. Soc., Southampton, Engl. 24-25 Apr. 1968

(RAE-TR-68191) Avail: CFSTI

A description is given of the ion engine and the 550 W deployable solar array proposed for the Black Arrow X5 spacecraft. Problem areas are discussed and an indication is given of the present state of development.

Author (ESRO)

N69-24313# Central Mechanical Engineering Research Inst., Durgapur (India).

PROSPECTS OF SOLAR POWER PLANTS IN INDIA

M. M. Shah Aug. 1968 26 p refs

(M7) Avail: CFSTI

The theoretical and practical aspects of solar power plants are discussed and an assessment is made of the feasibility of building such plants in India. It is concluded that under present Indian conditions of materials' availability, fabrication facilities, etc., building of solar power plants would be advantageous in only a few special cases.

Author

N69-27843*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

A COMPUTER PROGRAM TO DETERMINE THE EFFECT OF CHARGED-PARTICLE IRRADIATION ON SOLAR-CELL OUTPUT POWER

A. F. Obenshain May 1969 49 p refs Submitted for publication

(NASA-TM-X-63559; X-716-69-168) Avail: CFSTI CSCL 10B

A major consideration in designing a solar array is the charged particle environment in which it will operate. The computer program described here, developed to calculate the effects of charged-particle flux on the power output of a single solar cell, will greatly reduce the lengthy and laborious hand calculations now necessary in designing an array. The program transforms the particle

environment of a given orbit into a 1-Mev equivalent electron flux, and degrades an individual solar-cell I-V characteristic to account for the effect of this flux. The output of the program is the value of the damage-equivalent normally incident (deni) 1-Mev electron flux and a series of current-voltage points representing the I-V characteristic of the degraded solar cell. Author

N69-28123*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

CALORIMETRIC EVALUATION OF THREE 1.5-METER-DIAMETER INFLATABLE RIGIDIZED SOLAR CONCENTRATORS

Marvin D. Rhodes Washington Jun. 1969 35 p refs

(NASA-TN-D-5234) Avail: CFSTI CSCL 10B

The calorimetric efficiency of two 1.52-meter-diameter inflatable rigidized solar concentrators has been determined in order to evaluate their potential use with solar dynamic-cycle power systems. The membranes for these models were fabricated by different construction techniques and rigidized in a simulated space-vacuum environment with different foam materials (polyurethane and epoxy). Neither model was capable of satisfying typical design requirements of dynamic-cycle systems. The polyurethane-foam model had the higher calorimetric efficiency of the two models (0.61 at an aperture ratio of 7.6 as compared with 0.43 for the epoxy-syntactic-foam model); however, both models had about the same contour accuracy. In addition, these two models were compared with an epoxy-fiber glass model rigidized at atmospheric pressure. Failure of all three models to meet the typical design requirements of the Brayton and Rankine cycle systems is due to low geometrical accuracy and low specular reflectance.

Author

N69-29374*# General Electric Co., Philadelphia, Pa.

PHOTOVOLTAIC POWER SYSTEMS ON FLIGHT SPACECRAFT LUNAR ORBITER 3

C. J. Drazdauskas and M. D. Read 26 May 1969 303 p refs

(Contract NAS7-547)

(NASA-CR-100700; Doc-69SD4225) Avail: CFSTI CSCL 09E

Design and performance of the power subsystem in the Lunar Orbiter 3 are described, with emphasis on data serving the interests of power system design engineers. For the purpose of the report, the power system is defined as all those subsystems and discrete assemblies that exist for the function of supplying electrical power to the spacecraft. This includes the solar array, battery, and the associated electronics comprising the battery charge regulator, shunt relator heat dissipation elements, and circuits required for the power subsystem telemetry. In addition to background information on the project and summaries on the spacecraft and its mission, the report covers power subsystem performance, components, quality assurance, solar array tests, costs, spacecraft tests, parts and materials lists, and technical problems that were encountered.

K.W

N69-30038# Joint Publications Research Service, Washington, D.C.

WORKING OF HELIOSTATIONS DESCRIBED

M. M. Koltun 12 Jun. 1969 9 p Transl. into ENGLISH from Khim. i Zhizn (USSR), no. 5, 1959 p 17-22

(JPRS-48222) Avail: CFSTI

The physics of converting solar energy into electrical power is analyzed, as well as several types of devices which are capable of accomplishing this transformation. At present, there are no efficient, inexpensive, and durable systems in operation, but a Soviet power plant is in the design phase and is to be constructed within the next few years. This installation is designed to output 2.2 million kW/hr per year, and the steam from the turbine generator will power an absorption refrigerator to produce 20 tons of ice per hour. The problems and shortcomings of such a multistage cycle

system are briefly mentioned, followed by a discussion of an alternative technique utilizing thermocouples, which is less sophisticated but more efficient. This result is obtained because thermoelectric elements allow the most inefficient stage, steam, to be eliminated from the energy conversion cycle. Mention is also made of a solar electric power plant being developed for desert installation, in which parabolic mirrors are used as sun ray concentrators. A.C.R.

N69-31895* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLAR ABSORPTANCES AND SPECTRAL REFLECTANCES OF 12 METALS FOR TEMPERATURES RANGING FROM 300 TO 500 K

Ernie W. Spisz, Albert J. Weigand, Robert L. Bowman, and John R. Jack Washington Aug. 1969 22 p refs
(NASA-TN-D-5353) Avail: CFSTI CSCL 11F

The solar absorptance of 12 metals (Al, Cu, Au, Mo, Ni, Pt, Ag, stainless steel 304, Ta, Sn, Ti, and V) were determined over the temperature range from 250 to 550 K by two different experimental methods. Direct measurements of solar absorptance were made with a cyclic radiation method using a high intensity carbon arc solar simulator. Indirect measurements of solar absorptance were obtained from spectral reflectance measurements obtained from an integrating sphere reflectometer over the wavelength range from 0.33 to 2.16 μm . The solar absorptance data as obtained from the two different methods as well as the spectral reflectance data are presented for the 12 metals. Author

N69-32305* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.

NIMBUS-D SOLAR-CONVERSION POWER SUPPLY SUBSYSTEM Quarterly Technical Report, 15 Dec. 1968-15 Mar. 1969

18 Jun. 1969 190 p refs

(Contract NAS5-10470)

(NASA-CR-103418; AED-R-3443; QTR-5) Avail: CFSTI CSCL 10B

Solar conversion power-supply subsystem development is reported upon in the manufacture, calibration, and engineering test stage. Intended for use in the Nimbus-D meteorological satellite, the subsystem consists of one solar array, one control module, and eight storage modules. Solar cell humidity tests, substrate procurement, evaluation of the destruct units, and module fabrication were completed. Storage module nickel-cadmium batteries were procured; acceptance testing, inspection, and fabrication of heat sinks were in progress. Control module beginning-of-life I-V characteristics were charted. Component and reliability testing, and performance characteristics are tabulated and/or illustrated. M.H.E.

N69-35592 Centre National d'Etudes Spatiales, Paris (France).

SPACE SOLAR GENERATOR DEGRADATION AND INFLUENCE ON THEIR DESIGN [DEGRADATION DES GENERATEURS SOLAIRES SPATIAUX ET INFLUENCE SUR LEUR CONCEPTION]

M. H. Daspet CERTS Determination of Radiation Doses in Space 1969 p 369-382 refs In FRENCH, ENGLISH summary

Copyright Avail: Issuing Activity

For space applications a solar generator was made for converting radiation energy into electrical energy. Several systems have been studied, but two principal versions are used. The first one is the miniaturization of a solar oven, such as those used on the ground, but the realization and utilization of a large focussing mirror in space causes difficulties. The second uses semi-conductor devices to convert the incident electromagnetic radiation into electrical energy without any focussing or concentration subsystem.

This system, currently called solar generator, is utilized universally since it has been set up on more than 500 satellites. The major weakness of space solar generators lies in the vulnerability of solar cells to charged particles in space. Present operational solar cells are made of silicon, and from the basic operating principles of a p-n or n-p junction, specially designed for energetic conversion, it appears that the degradation takes place in the bulk of the silicon, the electrical properties of which are modified by collisions with the protons and the electrons. Consequently, researches have been carried out in order to find a solution to this problem. The first solution consists in protecting the cell with a filter, the function of which is to stop charged particles without interfering with the useful solar radiation. It is universally used, but it lowers the power/weight ratio of solar cells. The second solution consists in improving the electronic properties of silicon and in doing it in such a way that they are preserved during the photocell manufacture. A third solution, the most complex and onerous one, consists in elaborating a new type of solar cell, less sensitive to charged particle radiation with a better power/weight ratio, a greater strength and a lower cost price. Cadmium telluride and cadmium sulphide cells are about to offer such advantages. Author (ESRO)

N69-38442* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.

NIMBUS-D SOLAR CONVERSION POWER SUPPLY SUBSYSTEM Quarterly Technical Report, 15 Mar. 15 Jun. 1969

5 Sep. 1969 223 p

(Contract NAS5-10470)

(NASA-CR-106009; AED-R-3472; QTR-6) Avail: CFSTI CSCL 10A

Reported is the manufacturing and qualification testing of a modified solar conversion power supply subsystem for use with the Nimbus-D meteorological satellite. The system consists of eight identical storage modules, one control module, and one solar array. Two solar cell platforms containing n-on-p silicon solar cells mounted on each side of the sun oriented platforms comprised the solar array. Post manufacturing electrical confidence tests on 10- and 6-cell solar modules were satisfactory. Data from control module, storage module, and solar array acceptance tests are included. G.G.

N69-38646* Electro-Optical Systems, Inc., Pasadena, Calif.

DEVELOPMENT OF LIGHTWEIGHT SOLAR PANELS Summary Report, Jan. 1966-Mar. 1969

J. A. Carlson Oct. 1969 211 p refs

(Contract NAS7-428)

(NASA-CR-66832) Avail: CFSTI CSCL 10B

This report summarizes results in the development of lightweight, rigid solar panels. The specific areas which are documented in this report are related to the fabrication, assembly, and testing of demonstration panels. Presented are the design tradeoffs, optimization studies, and array and mechanisms designs which are completed. Author

N69-38783* Princeton Univ., N.J. Dept. of Aerospace and Mechanical Sciences.

AEROSPACE SYSTEMS AND MISSION ANALYSIS RESEARCH: SOLAR ELECTRIC SPACE MISSION ANALYSIS Final Report

P. M. Lion, M. Handelsman, and J. P. Layton 15 Jan. 1969 66 p refs

(Contract NSR-31-001-078)

(NASA-CR-106089; AMS-843) Avail: CFSTI CSCL 22C

In preliminary mission analyses for solar powered, electric rocket propelled spacecraft on Mars orbiter, Jupiter flyby, and asteroid belt exploration, trajectories were undertaken within the Aerospace Systems and Mission Analysis Research (ASMAR)

Program. Mars orbiter trajectories in the years 1971, 1973, 1975, 1977 and 1979 were checked approximately using an ASMAR modification of the ITEM interplanetary trajectory computer program. Another ASMAR computer program, Gordon 1, was used to optimize solar electric propelled Jupiter flyby trajectories which identified several trajectory modes and gave an understanding of the sensitivities to launch vehicle and propulsion technology. Preliminary analyses of asteroid belt exploration missions, especially rendezvous trajectories with advanced technology, indicate an interesting and possibly important application of solar electric propulsion for various asteroid, planetoid and cometary missions. Author

N69-40952* Textron Electronics, Inc., Sylmar, Calif. Heliotek Div.

DEVELOPMENT OF AN INTEGRATED LIGHTWEIGHT FLEXIBLE SILICON SOLAR CELL ARRAY Quarterly Technical Report, 1 Jul. - 1 Oct. 1969

E. L. Ralph, E. F. Zimmerman, and P. M. Stella Oct. 1969 61 p Prepared for JPL

(Contracts NAS7-100; JPL-952560)

(NASA-CR-106379; QTR-1) Avail: CFSTI CSCL 10B

The study is to provide design data that will help in the development of an integrated lightweight flexible silicon solar cell array significantly lighter and less expensive than arrays presently being designed. Included in this report are solar cell cost effectiveness comparison, a preliminary analysis of a continuous process solar cell ultra-thin cover installation process, a detailed analysis of solar cell interconnect stresses and an analysis of a ribbon substrate with associated test data. Author

N70-11303# European Space Research and Technology Center, Noordwijk (Netherlands).

PRIMARY ENERGY SOURCES AND CONVERSION SYSTEMS

K. H. Heffels In ESRO Proc. of the 6th ESRO Summer School, Vol. 6: Space Power Systems: Introduction Jul. 1969 p 25-56 refs

Avail: CFSTI

This report discusses solar, chemical and nuclear energy as energy sources for space power systems. A short description of the principles, problems and the present development status of solar cells, thermoelectric and thermionic converters, heat engines, primary batteries and fuel cells is given. A brief discussion of combinations of energy sources and converters is included. Author (ESRO)

N70-11427# Massachusetts Inst. of Tech., Cambridge. Energy Conversion and Semiconductor Lab.

ACTIVITIES CONCERNING ELECTRICAL, THERMAL, AND OPTICAL PROPERTIES OF SEMICONDUCTORS RELATED TO ENERGY CONVERSION Final Technical Report, 15 Jun. 1958 - 30 Nov. 1969

Richard B. Adler and Arthur C. Smith 1 Aug. 1969 31 p (Contract Nonr-1841(51))

(AD-693235) Avail: CFSTI CSCL 20/12

The document presents a capsule view of work performed under the contract over its ten year period. It includes abstracts of all technical reports and theses, and bibliography of published works. Also included are types, dates, and personnel for all graduate degrees awarded, based upon theses carried out with contract support. Author (TAB)

N70-12119* Carnegie-Mellon Univ., Pittsburgh, Pa.

HETEROJUNCTION SOLAR CELL CALCULATIONS

R. Sahai and A. G. Milnes Nov. 1969 32 p refs

(Grant NGR-39-087-002)

(NASA-CR-49827) Avail: CFSTI CSCL 10B

Solar cell efficiencies are computed for feasible semiconductor heterojunction cells of ZnSe GaAs, GaP Si, ZnSe Ge and

GaAs Ge. The analysis includes the loss in efficiency because of reflection, incomplete collection and internal series resistance. Optimum antireflection films are also calculated. The results are compared with the performances expected of Si solar cells and GaAs homojunction cells. ZnSe GaAs cells are shown to have the potential for exceeding the efficiency of both Si and GaAs cells, if interface recombination losses are small. The output voltage, voltage regulation and temperature performance should be superior to that of Si cells. The window effect in the heterojunction cell may also provide some inherent resistance to deterioration under radiation conditions. Author

N70-12695 Johns Hopkins Univ., Baltimore, Md.

SOLAR CELL POWER SYSTEMS ON U.S. SATELLITES. PART 2: SATELLITES DESIGNED BY THE JHU, APPLIED PHYSICS LABORATORY

Robert E. Fischell In ESRO Proc. of the 6th ESRO Summer School, Vol. : Space Power Systems: Appl. Jul. 1969 p 55-67 refs

Avail: CFSTI

This paper describes several types of conversion/energy storage systems in use at the Applied Physics Laboratory, in particular, those of Transit 1 B, 3 B and 4 B satellites. Solar arrays, storage batteries, regulation and performance are discussed. Author (ESRO)

N70-16228# Advisory Group for Aerospace Research and Development, Paris (France).

PHOTOVOLTAIC DEVICES AND SYSTEMS

M. Rodot (CNRS, Eudon, France) and H. Daspert (CNES, Bretigny-sur-Orge, France) In its Space Power Systems, Pt. 2 Nov. 1969 p 503-602 refs

Avail: CFSTI

A solar photocell is defined as a device in which solar energy is absorbed and converted into potential energy of an electron gas, and this electron gas, drifting through a potential barrier, is the active fluid of a current generator. The two tasks of absorption and collection of photoelectrons can be filled in one and the same device, using an adequate semiconductor as the absorber and an adequate physical discontinuity between two solid materials, one of which is the absorber, as the potential barrier. The well-known theory of the silicon cell is summarized and the factors affecting the conversion efficiency of the cell are discussed. A photovoltaic system is an assembly of elementary photocells, each of small surface area in comparison to the total surface of the system, capable of converting the incident solar energy into electrical energy. Several problems are analyzed which arise from the conception and realization of the solar array capable of producing energy in given conditions of lighting, temperature, and space environment. R.B.

N70-16229# Institute for Defense Analyses, Arlington, Va.

OPTIMIZATION OF ENERGY STORAGE FOR SOLAR SPACE POWER, APPENDIX 1

G. C. Szego and B. Paiewonsky In AGARD Space Power Systems, Pt. 2 Nov. 1969 p 603-618

Avail: CFSTI

In the area of thermal conversion of solar energy, it is assumed that energy storage should be carried out by floating a thermal storage system which stores heat energy usually in the form of latent heat of phase change, which operates in such a way as to provide thermal energy to the conversion system from storage during periods of non-illumination by the sun. Commonly obtainable conditions are discussed under which it becomes appropriate on a mass minimization basis either to store the energy during illuminated periods in the form of electrical energy or to combine thermal energy storage with electrical energy storage. An analysis is given on the basis of which the optimal system or combination can be predicted. The parameter variation limits have been chosen so that virtually all conceivable conditions of operation and performance of the conversion and storage elements are covered. R.B.

N70-17439# Selenia S. P. A., Rome (Italy).

SOLAR GENERATOR FOR ELDO F/9 [ALIMENTATORE SOLARE PER ELDO F/9]

F. Di Mauro 29 Jul. 1968 29 p In ITALIAN Sponsored by ELDO

(Rept-RT-68/719) Avail: CFSTI

This report concerns a study for determining the position of solar cell panels on the external satellite panels taking into account the specified power requirements (38 to 40W) and the effects of the antenna shadows. Author (ESRO)

N70-17621# European Space Research and Technology Center, Noordwijk (Netherlands).

POWER SYSTEMS IN ESRO SATELLITES

A. W. Preukschat Jul. 1969 22 p Presented at the 6th ESRO Summer School, Noordwijk, Neth., 1968

(ESRO-TN-83) Avail: CFSTI

The requirements and general design of a power system that uses solar cells as power source are discussed. Detailed summaries are given of the design of the power systems in the ESRO satellites ESRO 1, ESRO 2, and HEOS A, with a description of some of the units. Author (ESRO)

N70-20627** AiResearch Mfg. Co., Los Angeles, Calif.

RECUPERATOR DEVELOPMENT PROGRAM. SOLAR BRAYTON CYCLE SYSTEM Final Design Report

A. F. Anderson 19 Mar. 1968 270 p refs

(Contract NAS3-2793)

(NASA-CR-108945; HT-66-0207) Avail: CFSTI CSCL 10B

The results of all analytical and test work conducted during a program for the development of a recuperator to be utilized in a closed Brayton cycle space power system that uses solar energy as a heat source and argon as the working fluid are presented. The initial phase of the work was a parametric design study to determine the optimum recuperator operating conditions for the Brayton cycle. The study was followed by analysis and testing that was directed towards determining the final design configuration. The final phase of this program included fabrication and testing of a recuperator that was delivered to the NASA Lewis Research Center. A summary of the entire program is included. Author

N70-22507# European Space Research and Technology Center, Noordwijk (Netherlands).

DESIGN OF SOLAR CELL ARRAYS AND THEIR PERFORMANCE IN SPACE

Klaus K. Reinhartz In ESRO Proc. of the 6th ESRO Summer School, Vol. 9 Aug. 1969 p 17-33 refs 10-03)

Avail: CFSTI

The parameters are described which are important for solar generator design for spacecraft. Orbit parameter effects and the constraint effects imposed by the spacecraft are studied. Characteristics of fixed and oriented solar cell arrays and their mechanical design are also reviewed. The methods of electrical interconnection in an array are discussed, with emphasis on shadow effects and reliability considerations. Solar cell array performance in space is described, and typical values of the mass of solar generators are given. Author (ESRO)

N70-22865** Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

APPLIED MECHANICS

In its Space Programs Sum. No. 37-59, Vol. 3 31 Oct. 1969 p 156-171 refs (See N70-22851 10-34)

Copyright. Avail: CFSTI CSCL 13M

Described is a multilayer-insulation thermal vacuum setup designed to evaluate degradation effects of thermal blankets for the Ranger and Mariner spacecrafts. A preliminary study of nonlinear coupled subsystems for the Mariner solar panel system shows that nonlinear effects in a structural system are caused by nonlinear coupling units that can be determined by the receptance method.

A standard for the Mariner Mars temperature control flux monitor is established; set point temperature, aperture area, and the amount of electrical power in single power bids are calibrated so that the remaining variable width of the power pulse to the cone heater is the number of power bits. The receptance coupling computer program is extended to treat random nonstationary phenomena as well. G.G.

N70-22907** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

THERMAL SYSTEM DESIGN

In its Conceptual Design of a High Energy Astronomy Obs. 16 Feb. 1970 22 p refs

Avail: CFSTI

Preliminary results are presented for an effectiveness analysis of the HEAO thermal control system. The analysis consists of establishing characteristic parameters associated with the thermal control system, determining the values of the parameters, and generating a numerical measure of effectiveness for two thermal control concepts for the satellite. The values of the characteristic parameters were related to the solar arrays only. The thermal control concepts analyzed consist of a baseline system which utilized paint only. The vehicle configuration was the baseline consisting of the solar arrays mounted to the sides of the spacecraft with the center panel perpendicular to the sunline. Author

N70-22921** National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

POWER SYSTEM DESIGN, APPENDIX H

In its Conceptual Design of a High Energy Astronomy Obs. 16 Feb. 1970 32 p refs

Avail: CFSTI CSCL 10B

Design and sizing of the power system and its components were based on the maximum power capability of the surface area available for the solar array, based on the fact that power requirements are likely to increase. Maximum power available is limited to 820 watts, which includes 260 watts available for contingency. The problems emphasized in the design include the preliminary solar array layout, preliminary power system design, operational analysis, batteries, and load sharing. The power system design is based on use of Apollo telescope mount equipment where possible. R.B.

N70-24832# Gesellschaft fuer Weltraumforschung m.b.H., Bad Godesberg (West Germany).

SPACE EXPERIMENT POWER SUPPLIES

F. W. Kraemer In Univ. Coll., London Prelim. Design of a Cosmic X-ray Survey Expt. Oct. 1969 p 51-54 refs

Avail: CFSTI

The general design requirements of satellite power supplies, with particular reference to converter design is considered. It is assumed that the spacecraft includes a primary power source (e.g. solar cells and storage batteries), and the necessary power conditioning and control subsystem, in order to provide an unregulated DC supply at the interface between the spacecraft and the experiment. The experiment package itself incorporates a converter (or converters) to produce the voltage levels required by the individual units of the instrument. Author (ESRO)

N70-25500** Heliotek, Sylmar, Calif.

DEVELOPMENT OF AN INTEGRATED LIGHTWEIGHT FLEXIBLE SILICON SOLAR CELL ARRAY Quarterly Technical Report, 1 Jan. - 1 Apr. 1970

E. L. Ralph, E. F. Zimmerman, and P. M. Stella 1 Apr. 1970 54 p Prepared for JPL

(Contracts NAS7-100; JPL-952560)

(NASA-CR-109527; QTR-3) Avail: CFSTI CSCL 10B

02 SOLAR ENERGY

Results of a program to develop design data which will contribute to reduced cost and weight characteristics for lightweight, flexible solar cell arrays, are reported. Studies conducted include: (1) cost effectiveness comparison of solar cell coverglasses including conventional platelet, integral, and ribbon concepts; (2) interconnector flexure/tensile and thermal cycling study; and (3) wraparound interconnected module manufacturing feasibility and cost study. Author

N70-28421* Lockheed Missiles and Space Co., Sunnyvale, Calif. NASA Agena Systems Engineering.

SERT 2 SOLAR ARRAY Final Report

4 May 1970 141 p revised

(Contract NAS3-11512)

(NASA-CR-72706; LMSC-A941440-Rev) Avail: CFSTI CSCI 10B

The module level test program of those tests are reported which were required to demonstrate that the flight worthiness of the original solar array module design had not been invalidated by the modifications required by the SERT II Program, and that the SERT II solar arrays would withstand the vibration levels of a THORAD launch. The following tests were conducted: (1) deployment mechanism engineering evaluation tests, (2) release mechanism evaluation tests, (3) vibration confidence tests, and (4) flight acceptance tests. A thorough review of the designs, hardware, test programs, test data, engineering analysis, and product assurance assessments of the SERT II Solar Array has been completed. It is concluded that the solar arrays are flight worthy. Author

N70-29273* Defense Documentation Center, Alexandria, Va.

SOLAR CELLS AND SOLAR PANELS, VOLUME 1 Report Bibliography, Jan. 1958 Oct. 1969

Jan. 1970 114 p refs

(AD-700500; DDC-TAS-69-74-1-Vol-1) Avail: CFSTI CSCI 10/2

An annotated bibliography is provided of documents in which performance characteristics of various solar cells, particularly types containing gallium arsenides, silicon, or cadmium sulfides, are evaluated. Other reports include solar-cell fabrication, development of solar-cell power systems generating higher electrical power levels, in-flight solar-cell degradation studies, and systems for orienting solar panels continuously toward the sun. Author (TAB)

N70-29807* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

GEOMETRIC PROPERTIES OF A MODIFIED WHIRLING-MEMBRANE SOLAR-ENERGY CONCENTRATOR

John M. Jerke and Atwood R. Heath, Jr. Washington Jun. 1970 43 p refs

(NASA-TN-D-5859; L-6837) Avail: CFSTI CSCI 10B

The geometry of three modified paraboloidal whirling-membrane solar-concentrator models of 3.05-m diameter was measured by using an optical-ray-trace technique. The membranes were fabricated of 0.01-mm-thick aluminized plastic, attached to metal hubs, and rotated at 71 rad/s in a vacuum chamber. Geometric properties such as focal length, mean and standard-deviation errors, and geometric efficiency for three models with different metal-hub diameters are discussed and compared with results for a similar whirling-membrane model of an earlier investigation. Author

N70-30140* British Aircraft Corp., Filton (England). G. W. Technical Publications Dept.

A STUDY OF ADVANCED SOLAR ARRAY DESIGN Quarterly Report, 1 Aug. 31 Oct. 1969

K. K. Reinhartz, comp. (ESTEC) and D. W. Mann, comp. Paris ESRO Nov. 1969 52 p Sponsored by ESRO Prepared jointly with E. Turner (Elec. Instr.) Ltd.

(Contract ESTEC-623/68sl)

(ESRO-CR-12; QR-3) Avail: CFSTI

This third quarterly report

on solar array design deals with the mechanical system, cell attachment, quality assurance, panel design, cushioning materials, array frequency response, and discusses future tasks.

Author (ESRO)

N70-30210* European Space Research and Technology Center, Noordwijk (Netherlands).

CALIBRATION OF SOLAR CELLS

K. H. David Nov. 1969 15 p refs Presented at the 6th ESRO Summer School, Noordwijk, Neth., 1968

(ESRO-TN-79) Avail: CFSTI

Reasons are given for the interest in standard solar cells accurately calibrated in respect of AMO (Air Mass Zero) short-circuit current. Calibration of solar cells can be performed onboard a satellite or a balloon. Another method rests on the determination of the absolute spectral response of the cells. Calibrations of solar cells in respect of AMO short-circuit current can also be obtained from measurements in terrestrial sunlight at different solar elevations. The principles of these methods are outlined and their mutual advantages and disadvantages are discussed.

Author (ESRO)

N70-30228* Brown Univ., Providence, R.I.

PHOTOVOLTAIC SOLAR ENERGY CONVERSION

J. J. Loferski In ESRO Proc. of the 6th ESRO Summer School.

Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 13-30 refs

Avail: CFSTI

Expressions for the maximum power, current, and voltage to a matched load connected across an illuminated photovoltaic cell are derived along with ones for the maximum efficiency for conversion of monochromatic, black-body, and solar radiation. The expressions depend on the reverse saturation current $i_{sub r}$ and the short-circuit current $i_{sub s}$ of the illuminated photovoltaic cell. The physical origins of these two parameters are considered in detail and expressions for the spectral response of the cells are derived. Expressions for the solar energy conversion efficiency of photovoltaic solar cells as a function of energy gap are also presented.

Author (ESRO)

N70-30229* Brown Univ., Providence, R.I.

PERFORMANCE OF ACTUAL SOLAR CELLS

J. J. Loferski In ESRO Proc. of the 6th ESRO Summer School

Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 31-45 refs

Avail: CFSTI

The factors responsible for the differences between the theoretical and observed efficiencies of silicon cells are discussed. These include the internal series and shunt resistances, the values of minority carrier lifetime and diffusion length, and surface recombination losses and reflection and transmission losses. The temperature dependence of cell parameters is discussed and its relation to output power and voltage is considered.

Author (ESRO)

N70-30231* European Space Research and Technology Center, Noordwijk (Netherlands).

THIN-FILM SOLAR CELLS

K. H. Heffels In ESRO Proc. of the 6th ESRO Summer School

Vol. 8: Space Power Systems: Photovoltaic Energy Conversion Nov. 1969 p 77-93 refs

Avail: CFSTI

The potential and limitations of single-crystal solar cells for large-area arrays are reviewed and general design requirements, possibilities, and problems in thin-film solar cell construction are discussed. The state of the art in the fabrication of gallium

arsenide, cadmium sulphide, and cadmium telluride thin-film solar cells is reviewed and details of their characteristics are given.
Author (ESRO)

N70-30232# European Space Research and Technology Center, Noordwijk (Netherlands).

CALIBRATION OF SOLAR CELLS

K. H. David. In *ESRO Proc. of the 6th ESRO Summer School Vol. 8: Space Power Systems: Photovoltaic Energy Conversion* Nov. 1969 p 95-104 refs
Avail: CFSTI

Reasons are given for the interest in standard solar cells accurately calibrated in respect of AMO (Air Mass Zero) short-circuit current. Calibration of solar cells can be performed onboard a satellite or a balloon. Another method rests on the determination of the absolute spectral response of the cells. Calibrations of solar cells in respect of AMO short-circuit current can also be obtained from measurements in terrestrial sunlight at different solar elevations. The principles of these methods are outlined and their mutual advantages and disadvantages are discussed.

Author (ESRO)

N70-30560# Fraunhofer-Gesellschaft, Stuttgart (West Germany). Inst. fuer Technische Physik.

PROBLEMS OF ROOM HEATING IN SUMMER [ZUR PROBLEMATIK DER SOMMERLICHEN RAUMERWAERMUNG]

K. Gertis. In *its Examples of Appl. Res.* Jun. 1969 p 60-63 In GERMAN
Avail: CFSTI

Modern buildings have large window glass surfaces and in summertime, depending on glass type and wall material, room temperatures can become intolerable. To solve this problem, architects should choose suitable building materials for inner rooms rather than use expensive air-conditioning systems. ESRO

N70-32426# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

HIGH TEMPERATURE SOLAR FURNACE

V. A. Baum et al. 3 Mar. 1970 9 p refs Transl. into ENGLISH from *Geliotekhn., Akad. Nauk Uz. SSR*, no. 2, 1969 p 56-59 (AD-704754; FTD-HT-23-62-70) Avail: CFSTI CSCL 13/1

Description of the furnace and the absolute calorimeter for investigation power characteristics of solar power furnaces are given and also power characteristics and the region of temperatures in which thermophysical and radiation properties of refractories can be investigated are presented. Author (TAB)

N70-36227# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MATCHING A THERMIONIC CONVERTER WITH A SOLAR CELL IN A SOLAR POWER ARRAY

U. A. Arifov et al. 25 Feb. 1970 7 p refs Transl. into ENGLISH from *Geliotekhnika, Akad. Nauk Uz. SSR* (Tashkent), no. 1, 1969 p 41-43 (AD-704002; FTD-HT-23-42-70) Avail: CFSTI CSCL 10/2

The aim of the report is to determine the possibility of combining a high-temperature thermionic converter with a solar cell with partial use of its outer surface as the cathode with the introduction of the concentrator parameters corresponding to glass projector mirrors. Author (TAB)

N70-37465*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

STUDY OF FABRICATION TECHNIQUES FOR SiC SOLAR CELLS Final Technical Report

R. B. Campbell and H. S. Berman Jul. 1970 78 p refs (Contract NAS2-5595) (NASA-CR-73444; WANL-PR-TTT-001) Avail: CFSTI CSCL 10B

Silicon carbide unijunction diodes were investigated for use as possible solar cells. The devices can be used in this manner, although the overall conversion efficiency of solar energy into electrical energy is much lower than Si diodes. This lower efficiency is due mainly to fewer photons of proper energy available for conversion, reflection losses, and poor collection efficiency in the SiC diode. Both grown and diffused junctions were investigated. A graded junction structure with a junction depth of 15 microns was determined to be optimum. Techniques for applying gridded contacts were developed. The single junction cells exhibited maximum power at 250 C although they were operable at reduced efficiency to 400 C and would survive temperatures to 1000 C without damage. The cells operated satisfactorily when connected in series and parallel configurations. Several other cell structures such as the multiple junction and multiple transition were investigated. These structures show a greatly increased efficiency over the single junction cell. Author

N70-38210# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

SOLAR PANEL TEST SET

William E. Ray Feb. 1970 29 p (Contract N0W-62-0604-C)

(AD-707345; APL-TG-1103) Avail: CFSTI CSCL 14/2

The report describes the Solar Panel Test Set developed for testing solar cell panels in artificial sunlight at an equivalent sunlight intensity of 140 mW/sq.cm. The test set uses iodine-quartz (tungsten) lamps as the radiant-energy source, and the emerging radiation is uniformly reflected and totally diffused. An air conditioner, which is part of the test set, provides the cooling air necessary to control the temperature of the solar panel under test. The methods of calibrating the test set are described, and the accuracy of the measurements obtained when using artificial light as the radiation source is discussed. Author (TAB)

N70-40234* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

DEVICE FOR DIRECTIONALLY CONTROLLING ELECTROMAGNETIC RADIATION Patent

Morris Perlmuter and John R. Howell, inventors (to NASA) Issued 18 Jan. 1966 (Filed 5 Mar. 1964) 5 p Cl. 126-270 (NASA-Case-XLE-01716; US-Patent-3,229,682; US-Patent-Appl-SN-349778) Avail: US Patent Office CSCL 09E

An apparatus is described which can be used for either directing the emission of electromagnetic radiation in preferred directions or absorbing electromagnetic radiation only from desired angular ranges. Solar energy is directed toward an energy converter by selectively arranging the absorbing and reflecting surfaces of the device. R.B.

N70-43081*# Heliotek, Sylmar, Calif.

DEVELOPMENT OF AN INTEGRATED LIGHTWEIGHT FLEXIBLE SILICON SOLAR CELL ARRAY Final Report

E. L. Ralph, E. F. Zimmerman, and P. M. Stella [1970] 121 p Prepared for JPL (Contract NAS7-100; JPL-952560) (NASA-CR-110913) Avail: NTIS CSCL 10B

A comprehensive and complete description of the pertinent portions of this program in a self-contained format is presented. The objective of this program was to develop methods and analytical techniques which could be used to fabricate an integrated lightweight flexible silicon solar cell array blanket with the following capabilities: (1) providing 120 watts per pound of array weight, (2) being manufactured at a cost of \$100 per watt of raw power, and (3) being produced in modular prefabricated sections. The study effort was divided into seven major tasks in order to examine individual components comprising the total array concept. Author

N71-11056* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLAR CELL SUBMODULE Patent
 Robert K. Yasui, inventor (to NASA) Issued 3 Feb. 1970 (Filed 20 Apr. 1966) 5 p. Cl. 136-89; Int. Cl. H01m Sponsored by NASA

(NASA-Case-XNP-05821; US-Patent-3,493,437;
 US-Patent-Appl-SN-545223) Avail: US Patent Office CSCL 10B

Methods of constructing matrices of submodules for solar cells are described. The cells in each submodule are arranged in parallel and one terminal of each cell is connected near one end, with an undulative busbar having raised portions between the points of contact of the busbar with each of the cells. A second busbar, which includes a group of protruding tabs, is connected to each cell near the other end, with the tabs extending from it. After the cells forming each submodule are connected to the two busbars, the submodule includes the two bars as an integral part. The submodule may then be calibrated to determine its energy conversion characteristics. R.B.

N71-11063# Royal Aircraft Establishment, Farnborough (England).
LARGE SOLAR ARRAY DEVELOPMENT IN UK
 F. C. Treble Jan. 1969 28 p refs Presented at the 7th IEEE Photovoltaic Specialists Conf., Pasadena, Calif., 19-21 Nov. 1968 (RAE-TR-69007) Copyright. Avail: NTIS

Aspects of large solar array technology are reviewed, with particular reference to the development of an experimental 560 W deployable array. The array consists of very thin silicon solar cells mounted on Kapton polyimide film. It is stowed by folding the Kapton concertina fashion into rectangular compartments and deployed by pneumatically-actuated telescopic masts. Deployment is initiated by duplicated pyrotechnic actuators and takes about two minutes to complete. The estimated weight of the 78 sq ft array, including stowage compartments, cushioning, and deployment mechanism, is 25.2 lb, giving a power-weight ratio of 22.3 W/lb at 55 C. Author

N71-13427* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Engineering Mechanics Div.

PARAMETRIC STUDY OF THE PERFORMANCE CHARACTERISTICS AND WEIGHT VARIATIONS OF LARGE-AREA ROLL-UP SOLAR ARRAYS

J. V. Coyner, Jr. and R. G. Ross, Jr. 15 Dec. 1970 31 p refs (Contract NAS7-100)

(NASA-CR-115821; JPL-TR-32-1502) Avail: NTIS CSCL 10B

An analysis has been conducted to determine the relationships between the performance characteristics (power-to-weight ratio, blanket tension, structural member section dimensions, and resonant frequencies) of large-area roll-up solar arrays of the single-boom, tensioned-substrate design. The study includes the determination of the size and weight of the base structure supporting the boom and blanket and the determination of the optimum width, blanket tension, and deployable boom stiffness needed to achieve the minimum-weight design for a specified frequency for the first mode of vibration. A computer program has been used to generate a set of plots that provide optimum structural sizing and estimated weights for arrays with blanket areas ranging from 100 to 400 square feet and for first-mode natural frequencies ranging from 0.03 to 0.7 Hz. Use of these plots enables a quick evaluation of the potential merits of a proposed roll-up array. Author

N71-15622* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
HIGH TEMPERATURE LENS CONSTRUCTION Patent
 Kenneth R. Lorell, inventor (to NASA) Issued 3 Feb. 1970 (Filed 22 Jun. 1966) 5 p. Cl. 350-213; Int. Cl. G02b3/00, 7/02 Sponsored by NASA

(NASA-Case-XNP-04111; US-Patent-3,493,291;
 US-Patent-Appl-SN-560969) Avail: US Patent Office CSCL 20F

Described is a lens assembly for solar furnace or solar simulator entrances. To prevent lens destruction by operational heat, the lens assembly is made up of a multiplicity of identical

quartz lens blocks carefully clustered together in a side-by-side, continuous relationship within a common plane to form compact lens units. Relief openings between the ends of adjacent segments contain spherical keys to prevent displacements of individual lens blocks. G.G.

N71-16462* Lockheed Missiles and Space Co., Sunnyvale, Calif. SSD Power Systems.

EVALUATION OF SPACE STATION SOLAR ARRAY TECHNOLOGY AND RECOMMENDED ADVANCED DEVELOPMENT PROGRAMS First Topical Report

28 Dec. 1970 544 p refs

(Contract NAS9-11039)

(NASA-CR-114828; LMSC-A981486) Avail: NTIS CSCL 22B

The technology and analytical techniques to support the development of a solar power system for large space stations are discussed. The goals of the program are to: (1) establish design requirements, (2) perform technology evaluation of existing techniques, (3) identify specific areas where technology advancement is needed, and (4) prepare a plan for development of the required technology. Author

N71-16472* Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.

STUDY TO DETERMINE AND IMPROVE DESIGN FOR LITHIUM-DOPED SOLAR CELLS Quarterly Report, 1 Oct. 31 Dec. 1970

T. Faith, G. Brucker, and A. Holmes-Siedle 10 Jan. 1971 23 p refs Prepared for JPL

(Contracts NAS7-100; JPL-952555)

(NASA-CR-116220; AED-R-3692F; QR-6) Avail: NTIS CSCL 10B

The action of lithium in producing a recovery or spontaneous annealing of radiation damage in bulk silicon and silicon solar cells is discussed. Analytical techniques to characterize the radiation resistance of lithium-doped solar cells and its dependence on the materials and processes used to fabricate the solar cells are presented. Recommendations for an improved design of lithium-doped solar cells are included. Author

N71-17248# Communications Satellite Corp., Washington, D.C.
FOREIGN SOLAR CELL SYMPOSIUM Summary Report

Denis J. Curtin [1969] 49 p Conf. held at Washington, D.C., 22 Sept. 1969; sponsored by Commun. Satellite Corp.

Avail: NTIS

The proceedings of a conference on the manufacture of silicon solar cells are presented. Topics discussed are a description of foreign solar cell manufacturing processes, manufacturing facilities, cell efficiencies, cell prices, types of cell contacts, radiation resistance of solar cells, and solar cell interconnects. Thin film solar cells, including cadmium sulfide and cadmium telluride solar cells, are discussed. An evaluation of the present status of the thin film cell work in Europe to determine when the cell might be fully developed is reported. Author

N71-19649* Hughes Aircraft Co., Culver City, Calif.

PRIME POWER SYSTEMS, PART 6

In its Parametric Analysis of Microwave and Laser Systems for Commun. and Tracking, Vol. 3 Feb. 1971 p 475-523 refs

Avail: NTIS CSCL 10A

Three types of prime power systems for spacecraft power supplies are discussed. The systems are: (1) solar power systems which include solar thermoelectric systems, solar thermionic systems, and solar dynamic systems, (2) nuclear power systems using radio isotope sources or reactor dynamic systems, and (3) chemical power systems in the form of electric batteries and fuel cells. The effect of mission duration, power requirements, environment, and goals on the selection of power sources is presented. Author

N71-20273* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

ROLL-UP SOLAR ARRAY Patent

Herman P. Valentijn, inventor (to NASA) Issued 21 Oct. 1969 (Filed 9 Nov. 1967) 7 p. Cl. 244-1; Int. Cl. B64g1/10, 9/00

Sponsored by NASA

(NASA-Case-NPQ-10188; US-Patent-3,473,758;

US-Patent-Appl-SN-681687) Avail: US Patent Office CSCL 10B

A rollup solar array is described which consists of a plurality of arcuate solar panels furled on a tapered drum for spacecraft storage during launch. For space erection, the drums are rotated to extend the arcuate panels out from and around the spacecraft. An arcuate hollow beam along each panel edge stiffens the cantilevered panel. The beams are flattened as they are coiled on the drum and return to their hollow shape as they are uncoiled. Serrations in the beams avoid overstressing as the beams are flattened and opened. Official Gazette of the U.S. Patent Office

N71-20471* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio

SERT 2 SPACECRAFT ELECTRICAL POWER SYSTEM

Richard J. Krawczyk Washington Mar. 1971 22 p

(NASA-TM-X-2234; E-5990) Avail: NTIS CSCL 22B

The SERT 2 spacecraft utilizes a 1.5-kW solar array as the primary source of electrical power. The spacecraft power system controls this power as required for housekeeping functions, experiments, and ion thruster system. To meet mission objectives, three separate systems were designed and implemented - regulated dc power, unregulated dc power, and ac power. Extensive ground command capability allows versatility of configuration for normal as well as abnormal flight conditions. Redundancy, fusing, diode isolation, and automatic switching were employed to minimize possibilities of mission critical component failures. Design objectives have been demonstrated in flight. Author

N71-20727* Boeing Co., Seattle, Wash. Space Div.

LIGHTWEIGHT SOLAR PANEL DEVELOPMENT

Walter A. Hasbach Pasadena, Calif. JPL 15 Mar. 1971 36 p Prepared for JPL

(Contracts NAS7-100; JPL-952571)

(NASA-CR-117349; JPL-TR-32-1519) Avail: NTIS CSCL 10A

Technical information is reported concerning the preliminary design, analysis, fabrication, and test of a lightweight solar panel made of a built-up beryllium structure with an active cell area of 29 sq ft. Evaluations are presented of the results of the modal survey, reverberant acoustic, random vibration, sinusoidal vibration, static load, thermal-vacuum-shock, substrate frequency, and power output tests. Author

N71-21206* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THERMAL CYCLING TEST OF A FLEXIBLE SOLAR CELL MODULE

A. F. Forestieri, A. F. Ratajczak, and T. M. Klucher Mar. 1971 15 p

(NASA-TM-X-52995) Avail: NTIS CSCL 10A

A thermal cycling test was performed on a representative module of a flexible rolled-up solar array. The experiment was designed to expose the module to temperature cycles between 87 C in simulated sunlight and -108 C in darkness at a pressure of 10 to the minus 7th power torr. Conditions were chosen to simulate the temperature profile the array would experience while in orbit. The test module was exposed to over 2000 such cycles. The results showed that changes in open-circuit voltage and short-circuit current were within measurement error. The cover glasses did not crack or delaminate and the soldered silver mesh interconnect did not fail. Stains were visible on the module and there was a very slight darkening of the fiberglass reinforcing in the Kapton substrate. This did not appear to affect performance. Author

N71-22561* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena, Guidance and Control Div.

DESIGN AND DEVELOPMENT OF A 66-W/kg 23-m SQUARE ROLL UP SOLAR ARRAY

W. A. Hasbach In its JPL Quarterly Tech. Rev., Vol. 1, No. 1 Apr. 1971 p 68-77 ref 1

Copyright. Avail: NTIS HC\$6.00/MF\$0.95 CSCL 10A

Future space missions require greater power output, lighter weight, and decreased stowed volume for solar arrays. A program was initiated to develop the technology for a roll-up solar array by preparing a detailed design, performing the associated analyses, fabricating an engineering development model, and subjecting the engineering model to a comprehensive test program consisting of both environmental and developmental tests. The design and testing of the 66-W/kg (30-W/lb), 23-sq m (250 sq ft) roll-up solar array developed is described. Author

N71-23700* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

THE GENERATION OF POLLUTION FREE ELECTRICAL POWER FROM SOLAR ENERGY

William R. Cherry Mar. 1971 18 p refs

(NASA-TM-X-65497; X-760-71-135) Avail: NTIS CSCL 10B

A study is reported to determine the feasibility of electrical power plants, utilizing solar energy, to meet future US power demands. Investigation of a pollution free method using photovoltaics on the ground indicates that sunlight falling on about 1% of the land area of the 48 states could provide the total electrical power requirements of the U.S. in the year 1990. In addition, the findings indicate that while the cost of producing solar arrays by today's methods prohibits their use for large-scale terrestrial plants, the cost may become acceptable as conventional fuels become scarcer and more expensive. D.L.G.

N71-23714* General Electric Co., Philadelphia, Pa.

ROLLUP SUBSOLAR ARRAY. VOLUME 2: DETAILED TEST RESULTS Final Report

N. Shepard, P. Perez, K. Hanson, and R. Ross, (JPL) 1 Feb. 1970 340 p refs

(Contract NAS7-100; JPL-952314)

(NASA-CR-118006; DOC-70SD4286-Vol-2) Avail: NTIS CSCL 10A

The final assembly and system tests of the 30 Watt per pound rollup solar array engineering development unit are reported. Test results are described, analyzed and compared with analysis reported previously. Thermal bending tests of sections of the BISTEM boom and results are included. The test results have been assessed with respect to future qualification testing of a rollup solar array or integration with a spacecraft and recommendations for future programs are presented. Author

N71-25311* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

RESULTS FROM THE ATS 3 REFLECTOMETER EXPERIMENT

James B. Heaney In its Significant Accomplishments in Sci. and Technol. at Goddard Space Flight Center 1970 p 238-240

Avail: NTIS HC\$6.00/MF\$0.95 CSCL 04A

Highly reflective specular materials having aluminum or silver surfaces either uncoated or protectively coated together with Alzak, the material that comprises the outer shell of the OAO spacecraft, were evaluated. Coating samples were thermally insulated from their surroundings and their surface reflectances relative to a standard surface were monitored periodically by ATS 3 reflectometer. Spectral variations in the degradation processes and identifications of damage causes and mechanisms were observed. Alzak data confirmed laboratory tests that proved this material to be potentially unstable; solar absorptance of unshielded samples increased from initially 15% to 26% after 2000 hours of solar

02 SOLAR ENERGY

exposure in orbit. Results demonstrated that dielectric film coated aluminum produces a thermal control surface comparable to white paint but of better stability. G.G.

N71-26155* Goodyear Aerospace Corp., Akron, Ohio. **THERMALLY ACTIVATED FOAMING COMPOSITIONS Patent**

Charles E. Welling, inventor (to NASA) Issued 2 Dec. 1969 4 p
Filed 19 Sep. 1968 Cl. 260-2.5; Int. Cl. C08g22/44
Continuation-in-part of US Patent Appl. SN-553264, filed 25 May 1966 Sponsored by NASA

(NASA-Case-LAR-10373-1; US-Patent-3,481,887;

US-Patent-Appl-SN-761007) Avail: US Patent Office CSCL 11D

A storage stable, thermally actuable, foamable composition is described. The composition comprises a hydroxyl terminated prepolymer, 4, 4 prime- diphenyl methane diacetyl azine, bisphenol adduct of 4, 4 prime- diphenyl methane diisocyanate, a surfactant and a catalyst. Official Gazette of the U.S. Patent Office

N71-26726* Hughes Aircraft Co., Los Angeles, Calif.

SOLAR PANEL FABRICATION Patent

Preston S. Du Pont, inventor (to NASA) Issued 23 Feb. 1971 5 p Filed 17 May 1967 Cl. 156-212; Int. Cl. B29c17/04
Sponsored by NASA

(NASA-Case-XNP-03413; US-Patent-3,565,719;

US-Patent-Appl-SN-640456) Avail: US Patent Office CSCL 10A

Methods and apparatus are discussed for precisely fabricating solar cells on a substrate. The solar cells are mounted face down in a flexible mat. The mat is then bent to the configuration the cells will have in final assembled form, and then a substrate is bonded to the backs of all the cells at one time.

Official Gazette of the U.S. Patent Office

N71-28586 California Univ., Los Angeles.

THERMAL BEHAVIOR AND DESIGN OF CELLULAR MATRIX-POROUS BED SOLAR THERMAL CONVERTERS

Olufemi Akintunde Lalude (Ph.D. Thesis) 1969 339 p

Avail: Univ. Microfilms Order No. 70-14299

Studies of thermal performance of honeycomb structures when they are used to protect solid absorbers with no fluid transpiration through the honeycombs as well as porous absorbers with fluid transpiration through the honeycombs and absorbers were made. In the case of no fluid transpiration, a simple theoretical model which assumed uncoupled heat transfer by radiation, conduction, and free convection tended to underpredict temperature distribution in an effective emittance from the rectangular honeycombs with clear resin-overcoated-aluminized paper walls. In the case of air transpiration, a theoretical model was found to agree quite well with results of tests performed with an experimental module fitted with a number of rectangular honeycombs. The temperature distribution in and the thermal performance of honeycomb-porous bed solar thermal converters of the transpiration type were predicted using a theoretical model. The coupled integral energy equations obtained by carrying out energy balances on the various converter components were solved by the method of undetermined coefficients (collocation). Dissert. Abstr.

N71-31939# Clevite Corp., Cleveland, Ohio. Electronic Research Div.

IMPROVEMENTS IN CdS THIN FILM SOLAR CELLS Final Technical Report, 1 Nov. 1969-31 Oct. 1970

William F. Dunn Wright-Patterson AFB, Ohio ARL Jan. 1971 82 p refs

(Contract F33615-68-C-1182)

(AD-723315; ARL-71-0015) Avail: NTIS CSCL 10/2

The report is concerned with two areas in the cadmium sulfide thin film solar cell development program: (1) a report on space flight testing of CdS cells and (2) results of a development program for improving the stability and efficiency of the standard

CdS cell. Two space flight tests of CdS cells are reported. The first test, ARX-701, contained two CdS panels on the OV1-13 Satellite. The second space flight test contained one CdS panel, ARX-901, and was flown on the OV1-17 Satellite. A development program for obtaining engineering measurements from the CdS cell was carried out. A study was made of heating effects on the cadmium sulfide thin film cell after formation of the barrier layer. Additional investigations were made of low pressure laminations, a silver coated glass powder for metallized substrate use and variations in gridding attachment. Author (IGRA)

N71-33409* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SOLAR CELL Patent

Elmer R. Streed, inventor (to NASA) Issued 6 Jul. 1971 5 p
Filed 6 Feb. 1969

(NASA-Case-ARC-10050; US-Patent-3,591,420; US-Patent-Appl-SN-797219; US-Patent-Class-136-89) Avail: US Patent Office CSCL 10A

A solar cell which utilizes phosphors in the cover glass which are excited to fluorescence by solar ultraviolet radiation and particulate radiation is described. The fluorescent energy passes through the interference filter for utilization in the solar cell, while the ultraviolet and other radiation would not normally be converted to electrical energy because the wavelength is not within the spectral response limits of the solar cell. Author

N71-34042*# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

RESEARCH FOR THE IMPROVEMENT OF SILICON SOLAR CELL EFFICIENCY Status Report, 1 Jul. - 31 Dec. 1970

M. Wolf Jan. 1971 69 p refs

(Grant NGL-39-010-001)

(NASA-CR-121751; SR-17) Avail: NTIS CSCL 10A

The interrelationships between material and dimensional parameters in their influence on collection efficiency from both the base region and the diffused region were investigated. Some of the essential results were: (1) It is theoretically possible to collect over 99% of the minority carriers generated by photon absorption, even in thin solar cells. (2) A wide range of material and dimensional parameter combinations permits approaching the ideal case. (3) Until diffusion length in the diffused region can be better controlled than at present, improvement has to be accomplished through thickness reduction. (4) Reduction of surface recombination velocity will be a necessity. (5) Base region diffusion lengths, as achievable with present technologies, are sufficient from the collection efficiency viewpoint. (6) In the base region, the detrimental effect of the back contact can be neutralized by a drift field in front of the back contact. (7) Longer minority carrier lifetimes will be wanted. Author

N71-36441*# TRW Systems Group, Redondo Beach, Calif. **STUDY TO ESTABLISH CRITERIA FOR A SOLAR CELL ARRAY FOR USE AS A PRIMARY POWER SOURCE FOR A LUNAR-BASED WATER ELECTROLYSIS SYSTEM, PHASE 4 Final Technical Report, 15 Dec. 1970 - 15 Sep. 1971**

J. E. Boretz and P. Goldsmith 15 Sep. 1971 54 p refs

(Contract NAS8-21189)

(NASA-CR-119945; TRW-09681-6008-R000) Avail: NTIS CSCL 10A

The prototype solar array panel was subjected to structural-dynamic, acoustic, and thermal vacuum cycling tests. In addition, electrical performance tests were conducted at the beginning and upon completion of the qualification test program. The design configuration is now considered technology-ready for future lunar surface applications. It has comparatively high specific power and is recommended for use in earth-orbital and planetary exploration programs where deployable, rigid panel solar arrays are required. E.M.C.

N72-13046*# Electro-Optical Systems, Inc., Pasadena, Calif.
DEVELOPMENT OF LIGHTWEIGHT ALUMINUM HOLLOWCORE SOLAR CELL ARRAY TECHNOLOGY

J. A. Carlson [1971] 103 p refs

(Contract NAS1-9495)

(NASA-CR-112002; FR-4045) Avail: NTIS CSCL 10A

A baseline configuration for a three section folding array, with retraction capability, was developed which would utilize electroformed aluminum hollowcore substrates and beryllium frames. The three section array was not fabricated because of difficulties with impurities in the aluminum electroforming bath. A procedure was developed for etching the copper mandrel from virtually any size of aluminum hollowcore panel in approximately one hour. Procedures were developed for analyzing the content of peroxide, water, total aluminum, and lithium-aluminum-hydride in an aluminum electroforming solution. Author

N72-13396*# Maryland Univ., College Park. Dept. of Mechanical Engineering.

RESPONSE CHARACTERISTICS OF A THERMAL-HELIOTROPE SOLAR-ARRAY ORIENTATION DEVICE c14

Frederick H. Morse In NASA. Goddard Space Flight Center 5th Aerospace Mech. Symp. 1971 p 33-39 refs (See N72-13391)

Avail: NTIS CSCL 14B

The thermal heliotrope is a passive solar-array orientation device containing a bimetallic helix that rotates when activated by solar energy. The rate and extent of the rotation depends upon the properties of the two metals and the temperature of the helix. An energy-balance analysis is performed to determine the temperature distribution in the helix. By initially restricting the analysis, a simplified equation governing the response of the heliotrope is obtained. In order to gain insight into the response of the heliotrope, a series of experiments were performed. The results of these tests and the implications are presented. Author

N72-14029*# Boeing Co., Seattle, Wash. Aerospace Group.
SIMULATED SPACE ENVIRONMENT TESTS ON CADMIUM SULFIDE SOLAR CELLS Final Report

David R. Clarke and Henry Oman [1971] 229 p refs

(Contract NAS3-11838)

(NASA-CR-120840; D180-12700-1) Avail: NTIS CSCL 10A

Cadmium sulfide (Cu₂S - CdS) solar cells were tested under simulated space environmental conditions. Some cells were thermally cycled with illumination from a Xenon-arc solar simulator. A cycle was one hour of illumination followed immediately with one-half hour of darkness. In the light, the cells reached an equilibrium temperature of 60 C (333 K) and in the dark the cell temperature dropped to -120 C (153 K). Other cells were constantly illuminated with a Xenon-arc solar simulator. The equilibrium temperature of these cells was 55 C (328 K). The black vacuum chamber walls were cooled with liquid nitrogen to simulate a space heat sink. Chamber pressure was maintained at 0.000001 torr or less. Almost all of the solar cells tested degraded in power when exposed to a simulated space environment of either thermal cycling or constant illumination. The cells tested the longest were exposed to 10,050 thermal cycles. Author

N72-14032*# Scientific Translation Service, Santa Barbara, Calif.

EOLE BALLOON SOLAR GENERATORS

J. Bezaudun, ed. Washington NASA Dec. 1970 13 p Transl. of "Generateurs Solaires Eole-Balloons" Rept-70/CT/TA/EB/O. 671/Eole/B CNES, Centre Spatial de Toulouse. Div. Tech. Aérospatiales, Dept. Energie de Bord, Bretigny, 28 Sep. 1970 8 p

(Contract NASw-2035)

(NASA-TT-F-13836; Rept-70/CT/TA/EB/O.671/Eole/B) Avail: NTIS CSCL 10A

The results of qualification tests carried out with Eole balloon solar generator components are described. These include mechanical, electrical, environmental, and launch simulation tests. The components were found to be acceptable. Author

N72-19057*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LARGE-SCALE TERRESTRIAL SOLAR CELL POWER GENERATION COST: A PRELIMINARY ASSESSMENT

Adolph E. Spakowski and Lloyd I. Shure Mar. 1972 13 p refs (NASA-TM-X-2520; E-6675) Avail: NTIS CSCL 10A

A cost study was made to assess the potential of the large-scale use of solar cell power for terrestrial applications. The incentive is the attraction of a zero-pollution source of power for wide-scale use. Unlike many other concepts for low-pollution power generation, even thermal pollution is avoided since only the incident solar flux is utilized. To provide a basis for comparison and a perspective for evaluation, the pertinent technology was treated in two categories: current and optimistic. Factors considered were solar cells, array assembly, power conditioning, site preparation, buildings, maintenance, and operation. The capital investment was assumed to be amortized over 30 years. The useful life of the solar cell array was assumed to be 10 years, and the cases of zero and 50-percent performance degradation were considered. Land costs, taxes, and profits were not included in this study because it was found too difficult to provide good generalized estimates of these items. On the basis of the factors considered, it is shown that even for optimistic projections of technology, electric power from large-scale terrestrial use of solar cells is approximately two to three orders of magnitude more costly than current electric power generation from either fossil or nuclear fuel powerplants. For solar cell power generation to be a viable competitor on a cost basis, technological breakthroughs would be required in both solar cell and array fabrication and in site preparation. Author

N72-19066# Army Electronics Command, Fort Monmouth, N.J.
SOLAR CHARGER KIT EXPERIMENTAL

H. B. Seapker and J. W. Mount Nov. 1971 28 p

(DA Proj. 1S6-63719-DK-75)

(AD-734809; ECOM-3452) Avail: NTIS CSCL 10/2

The Solar Charger Kit was specifically developed to maintain the BB-501/U nickel-cadmium battery in service for the Integrated Observation System (IOS) AN/GVQ-10 when installed at remote observation post where no local power is available and supply replacements are frequently interdicted. The solar kit has broader application in any service wherever its output capacity is equal to the power demand. Author (GRA)

N72-21033*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLAR ARRAY COST REDUCTION

D. T. Bernatowicz 1972 11 p Proposed for presentation at 25th Power Sources Symp., Atlantic City, 23-25 May 1972; Sponsored by USAMC

(NASA-TM-X-68035; E-6859) Avail: NTIS CSCL 10A

A brief description is given of the cost of solar power systems over the last decade and means by which cost reductions may be achieved in the future. Costs were broken down into nonrecurring and recurring costs for solar array, battery, and power conditioning. Correlation of costs with power were poor; however, costs correlated reasonably well with the array area. E.H.W.

N72-25022*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COST STUDY OF SOLAR CELL SPACE POWER SYSTEMS

Daniel T. Bernatowicz 1972 4 p Presented at 9th Photovoltaic Specialists Conf., Silver Spring, Md., 2-4 May 1972; sponsored by IEEE

(NASA-TM-X-68054; E-6904) Avail: NTIS HC \$3.00 CSCL 10A

Historical costs for solar cell space power systems were evaluated. The study covered thirteen missions that represented a broad cross section of flight projects over the past decade. Fully burdened costs in terms of 1971 dollars are presented for the system and the solar array. The costs correlate reasonably well with array area and do not increase in proportion to array area. The trends for array costs support the contention that solar cell and module standardization reduce costs. Author

02 SOLAR ENERGY

N72-26034* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.

CONSIDERATIONS WITH RESPECT TO THE DESIGN OF SOLAR PHOTOVOLTAIC POWER SYSTEMS FOR TERRESTRIAL APPLICATIONS

Paul A. Berman 15 Jun. 1972 16 p refs
(Contract NAS7-100)

(NASA-CR-127031; JPL-TR-32-1558) Avail: NTIS HC \$3.00 CSCL 10A

The various factors involved in the development of solar photovoltaic power systems for terrestrial application are discussed. The discussion covers the tradeoffs, compromises, and optimization studies which must be performed in order to develop a viable terrestrial solar array system. It is concluded that the technology now exists for the fabrication of terrestrial solar arrays but that the economics are prohibitive. Various approaches to cost reduction are presented, and the general requirements for materials and processes to be used are delineated. Author

N72-27055* National Academy of Sciences-National Research Council, Washington, D.C. Ad Hoc Panel on Solar Cell Efficiency.

SOLAR CELLS: OUTLOOK FOR IMPROVED EFFICIENCY 1972 78 p refs

(Contract NSR-09-012-903)

(NASA-CR-127234) Avail: NTIS HC \$6.00 CSCL 10A

Studies are reported on the technical feasibility of increasing the efficiency of solar cells for use in space programs.

N72-27056* National Academy of Sciences-National Research Council, Washington, D.C.

THE PANEL'S REPORT

In its Solar Cells: Outlook for Improved Efficiency 1972 p 1-22 refs

CSCL 10A

The panel's considerations, conclusions, and recommendations for improving the efficiency of solar cells are summarized. Topics discussed include: benefits of increased solar cell efficiency, solar cell efficiency, and solar cell materials other than silicon. It is concluded that silicon solar cells offer the best opportunity for increased efficiency at lowest cost and shortest payoff time.

F.O.S.

N72-27057* National Academy of Sciences-National Research Council, Washington, D.C.

AN INTRODUCTION TO THE PHYSICS OF SOLAR CELLS

Joseph J. Loferski In its Solar Cells: Outlook for Improved Efficiency 1972 p 25-49 refs

CSCL 10A

The physical processes underlying solar-energy conversion through the photovoltaic effect have been examined. The important roles played by bulk and surface recombination have been discussed. The relation between the basic material parameters and the current voltage characteristics of solar cells were reviewed. The maximum efficiencies for solar-energy conversion that can be expected for a number of semiconductors exceed the best values ever reported for any solar cell by a factor of at least 2. In the case of silicon, there is a considerable gap between the currently encountered 11 percent conversion efficiency and the 16 to 20 percent values predicted by analysis of the photovoltaic effect for that material. Author

N72-27059* National Academy of Sciences-National Research Council, Washington, D.C.

THE FUNDAMENTALS OF IMPROVED SILICON SOLAR-CELL PERFORMANCE

Martin J. Wolf In its Solar Cells: Outlook for Improved Efficiency 1972 p 56-70 refs

CSCL 10A

The loss mechanisms in present silicon solar cells were reexamined and their impact on conversion efficiency in air mass

zero and air mass one sunlight analyzed. Attention was focused on the process-dependent losses that affect collection efficiency, voltage factor, and curve factor. The collection efficiency can be improved by 22 percent by reducing the surface recombination velocity for short-wavelength collection efficiency improvement and by increasing the minority carrier lifetime in thin cells to be combined with a drift field at the back contact for better collection in the long-wavelength range. Voltage factor and curve factor together can yield 56 percent efficiency improvement through reduction of base region resistivity, while maintaining the minority carrier lifetime near present values. Accomplishment of these changes should yield conversion efficiency values near 20 percent in air mass zero sunlight. Ideal conversion efficiencies were arrived at through thermodynamically based theories.

Author

N72-29046* Army Foreign Science and Technology Center, Charlottesville, Va.

DOUBLE-MIRROR SOLAR ENERGY CONCENTRATORS USING NICKEL PARABOLIC REFLECTORS

G. Ya. Umarov, A. K. Alimov, Dzh. V. Alavutdinov, and V. N. Zakirova 29 Jan. 1972 8 p refs Transl. into ENGLISH from Geliotekh., Atad. Nauk Uzb. SSR (USSR), no. 6, 1970

(AD-741880; FSTC-HT-23-1004-72) Avail: NTIS CSCL 20/6

A double-mirror system consisting of two concave mirrors significantly increases maximum flux density and the equilibrium temperature of an absolutely black body. One consisting of concave and convex parabolic mirrors has little decrease in maximum flux density and adjustment power, whereas the system's angle of opening is significantly decreased, improving efficiency of the device. Author (GRA)

N72-31077 Fabbrica Italiana Apparecchi Radio S.p.A., Milan (Italy).

SOLAR ARRAY SIMULATOR

R. Formica In ESRO Spacecraft Power Conditioning Electron. Jul. 1972 p 309-314

Three possible design approaches for solar array simulators to be used during ground tests on satellite power systems conditioning electronic are described. The first two designs have already been manufactured and used: the first one in the development tests of the ELDO-PAS launcher and the Sirio satellite power system, and the second for testing the ESRO-4 power system. The third is a modification of the second. In the design the following major points have been considered: (1) simulation of the V/I characteristic as close as possible to the effective solar array characteristic; (2) full manual regulation of short-circuit current, open-circuit voltage and output resistance in the voltage mode operation; (3) modularity, in order to combine a certain number of solar array panels in series or paralleled to reach the required power levels; (4) dc and ac impedance as close as possible to the actual solar panels; and (5) capability of short-circuit current modulation to simulate eclipse input and output or boom shadows; this modulation is to be obtained by means of external signals (voltage or current). Author (ESRO)

N72-31083* Army Foreign Science and Technology Center, Charlottesville, Va.

SEMICONDUCTOR SOLAR ENERGY CONVERTERS AND THE PHENOMENON OF PHOTO CONDUCTIVITY QUENCHING

M. S. Isamukhamedova and P. M. Karageorgiy-Alkalayev 1 Feb. 1972 8 p refs Transl. into ENGLISH from Geliotekhnika. Akad. Nauk Uz. SSR (Tashkent), no. 3, 1970

(AD-743031; FSTC-HT-23-1577-71) Avail: NTIS CSCL 20/12

A semiconductor model with two impurity levels exchanging current carriers is analyzed to determine the conditions for the occurrence of photoconductivity quenching. The effects of this phenomenon on efficiency are described. Author (GRA)

N72-31092* National Academy of Sciences-National Research Council, Washington, D.C. Board on Science and Technology for International Development.

SOLAR ENERGY IN DEVELOPING COUNTRIES: PERSPEC-

TIVES AND PROSPECTS

Mar. 1972 60 p refs
(Contract AID/csd-2584)
(PB-208550; TA/OST-NAS-72-34) Avail: NTIS HC \$4.50
CSCL 10A

This is a report of an ad hoc advisory panel, made up of specialists from the United States and abroad, to: (1) assess the state of the art in utilizing solar energy for developing countries and review current practical applications; (2) identify promising areas for research and development; and (3) examine the desirability of establishing an international solar energy institute in North Africa, to carry out solar energy research and development. GRA

N72-31637* Lockheed Missiles and Space Co., Sunnyvale, Calif.

SOLAR ENERGY POWERED HELIOTROPE Patent

Ralph Crawford, inventor (to NASA) Issued 25 Jul. 1972 6 p
Filed 25 Sep. 1970 Supersedes N71-28460 (09 - 16, p 2628)
Sponsored by NASA
(NASA-Case-GSC-10945-1; US-Patent-3,678,685;
US-Patent-Appl-SN-75431; US-Patent-Class-60-23;
US-Patent-Class-60-26) Avail: US Patent Office CSCL 17G

A solar energy powered heliotrope which functions in a passive, stored energy manner to orient a solar array toward the sun is discussed. A bimetallic motor element is activated by solar energy to generate a work output. A constant torque spring assembly coupled to the motor element stores useful energy as a function of the work output. A bimetallic sensing element detects misorientation between the solar array and the sun. An escapement mechanism is actuated by the sensing element whenever misorientation between the solar array and the sun is detected; the escapement mechanism automatically and incrementally releases the stored energy to rotate the solar array in discrete increments until it is oriented towards the sun.

Official Gazette of the U.S. Patent Office

N72-32070* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

THE DEVELOPMENT, DESIGN AND TEST OF A 66 W/kg (30-W/lb) ROLL-UP SOLAR ARRAY

W. A. Hasbach and R. G. Ross, Jr. 15 Sep. 1972 38 p refs
(Contract NAS7-100)
(NASA-CR-128196; JPL-TR-32-1562) Avail: NTIS HC \$4.00
CSCL 10A

A program to develop a 250 square foot roll-up solar array with a power-to-weight ratio exceeding 30 watts per pound is described. The system design and fabrication of a full scale engineering development model are discussed. The system and development test program results are presented. Special test equipment and test procedures are included, together with comparisons of experimental and analytical results. Author

N72-33057* Lockheed Missiles and Space Co., Sunnyvale, Calif. Space Systems Div. Power Systems.

EVALUATION OF SPACE STATION SOLAR ARRAY TECHNOLOGY First Topical Report Update

Jul. 1972 141 p refs
(Contract NAS9-11039)
(NASA-CR-128533; LMSC-A981486) Avail: NTIS HC \$9.25
CSCL 10A

The research concerning lightweight solar array assemblies since 1970 is reported. A bibliography of abstracts of documents used for reference during this period is included along with an evaluation of available solar array technology. A list of recommended technology programs is presented. F.O.S.

N72-33061* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.

PHOTOVOLTAIC SOLAR ARRAY TECHNOLOGY REQUIRED FOR THREE WIDE SCALE GENERATING SYSTEMS FOR TERRESTRIAL APPLICATIONS: ROOFTOP, SOLAR FARM, AND SATELLITE

Paul A. Berman 15 Oct. 1972 27 p refs
(Contract NAS7-100)
(NASA-CR-128381; JPL-TR-32-1573) Avail: NTIS HC \$3.50
CSCL 10A

Three major options for wide-scale generation of photovoltaic energy for terrestrial use are considered: (1) rooftop array, (2) solar farm, and (3) satellite station. The rooftop array would use solar cell arrays on the roofs of residential or commercial buildings; the solar farm would consist of large ground-based arrays, probably in arid areas with high insolation; and the satellite station would consist of an orbiting solar array, many square kilometers in area. The technology advancement requirements necessary for each option are discussed, including cost reduction of solar cells and arrays, weight reduction, resistance to environmental factors, reliability, and fabrication capability, including the availability of raw materials. The majority of the technology advancement requirements are applicable to all three options, making possible a flexible basic approach regardless of the options that may eventually be chosen. No conclusions are drawn as to which option is most advantageous, since the feasibility of each option depends on the success achieved in the technology advancement requirements specified. Author

N73-10051* National Aeronautics and Space Administration, Washington, D.C.

RELIABILITY ANALYSIS OF THE SOLAR GENERATOR OF THE ESRO 1 SATELLITE

Sep. 1972 24 p Transl. into ENGLISH of Soc. Anonyme de Telecom. (Paris), no. 3015, 10 Nov. 1966 23 p
(NASA-TT-F-14498) Avail: NTIS HC \$3.25 CSCL 10B

The reliability of the solar generator of ESRO 1 is studied by investigating the reliability of its components. The reliability is determined for the following components: diodes, solar cells, wiring, and panels. It is deduced that the reliability of the solar generator depends principally on the reliability of the diodes near the hottest walls. F.O.S.

N73-10976* Pennsylvania Univ., Philadelphia. Towne School of Civil and Mechanical Engineering.

CONSERVATION AND BETTER UTILIZATION OF ELECTRIC POWER BY MEANS OF THERMAL ENERGY STORAGE AND SOLAR HEATING Interim Report, 1 Feb. - 1 Jul. 1971

Manfred Altman 1 Oct. 1971 265 p refs
(Grant NSF GI-27976)
(PB-210359; UPTES-71-1) Avail: NTIS HC \$6.75 CSCL 13A

A project to investigate the application of heat and coolness storage for comfort heating and air conditioning was initiated. Inexpensive salt hydrates exhibiting phase change temperatures between 40 F and 60 F were found appropriate with use of off-peak generation of coolness for storage and subsequent use during peak demand periods to supplement or replace electrically powered air conditioning units. Other inexpensive salt hydrates, with phase change temperatures of 89 F to 195 F were found for use as heat storage materials with solar heat collectors and off-peak electric heating units. A feasibility demonstration of the off-peak air conditioning system was built and successfully tested. Author (GRA)

N73-11050* Army Foreign Science and Technology Center, Charlottesville, Va.

CONTEMPORARY STATUS OF STUDIES ON DIRECT CONVERSION OF SOLAR ENERGY TO ELECTRICAL ENERGY

N. S. Lidorenko 28 Jul. 1972 11 p refs Transl. into ENGLISH from Geliotekhnika (Tashkent), no. 6, 1969 p 3-9
(AD-747293; FSTC-HT-23-1429-71) Avail: NTIS CSCL 10/2

Photoelectric, thermoelectric and thermoemission methods of direct conversion of solar energy into electric energy are studied. The article presents a review of modern methods of investigation. Author (GRA)

N73-12081* Los Alamos Scientific Lab., N.Mex.

LASER ACTIVATION OF SOLAR CELLS

Charles E. Backus 1972 11 p refs Presented at 9th IEEE

02 SOLAR ENERGY

Photovoltaic Specialist Conf., Silver Spring, Md., May 1972
Sponsored by AEC

(LA-DC-72-468; Conf-720518-1) Avail: NTIS

A preliminary investigation was conducted on the feasibility of using photovoltaic cells to convert laser energy into electrical energy. The tests were made with readily available solar cells and lasers. When using the He-Ne Laser, the efficiencies of the silicon cells were improved by about 50% compared to operation in sunlight. The improvement in efficiency could have conceivably been increased to about 90% if an optimum wavelength laser were used. Efficiencies of GaAs cells also were improved about 50% but could perhaps have been increased to about 130% with an appropriate laser. Author

N73-13866* Florida Univ., Gainesville. Solar Energy and Energy Conversion Lab.

SOLAR ENERGY, ITS CONVERSION AND UTILIZATION
Erich A. Farber / In NASA. Marshall Space Flight Center Space for Mankind's Benefit 1972 p 369-388

CSCL 10C

The work being carried out at the University of Florida Solar Energy and Energy Conversion Laboratory in converting solar energy, our only income, into other needed and useful forms of energy is described. A treatment such as this demonstrates, in proper perspective, how solar energy can benefit mankind with its many problems of shortages and pollution. Descriptions were given of the conversion processes, equipment, and performance. The testing of materials, solar water heating, space heating, cooking and baking, solar distillation, refrigeration and air-conditioning, work with the solar furnace, conversion to mechanical power, hot air engines, solar-heated sewage digestion, conversion to electricity, and other devices will be discussed. Author

N73-14812# Committee on Science and Astronautics (U. S. House).

SOLAR ENERGY RESEARCH. A MULTIDISCIPLINARY APPROACH

Philip B. Yeager Washington GPO 1973 120 p refs Presented by the Comm. on Sci. and Astronaut. at the 92d Congr., 2d Sess., 27 Dec. 1972

Avail: Comm. on Sci. and Astronaut.

Data, reported to the Committee on Science and Astronautics, on the current status and future potential of solar energy research are outlined. The information covers extent of need, who is doing the research and development, level of effort being extended, what the obstacles are - technological, economical, political and social, and the degree of reliance that can and should be placed in solar energy. Author

N73-15079*# General Electric Co., Philadelphia, Pa. Space Div.

FEASIBILITY STUDY OF A 110 WATT PER KILOGRAM LIGHTWEIGHT SOLAR ARRAY SYSTEM Quarterly Report, 1 Aug. - 31 Oct. 1972

N. F. Shepard, C. Stahls, A. Schneider, and K. L. Hanson 15 Nov. 1972 110 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953387)

(NASA-CR-130287; QR-2; Doc-72SD4249) Avail: NTIS HC \$7.50 CSCL 10A

An investigation of the feasibility of a solar array panel subsystem which will produce 10,000 watts of electrical output at 1 A.U. with an overall beginning-of-life power-to-weight ratio of at least 110 watt/kg is reported. A description of the current baseline configuration which meets these requirements is presented. A parametric analysis of the single boom, two blanket planar solar array system was performed to arrive at the optimum system aspect ratio. A novel concept for the stiffening of a lightweight solar array by canting the solar cell blankets at a small angle to take advantage of the inherent in-plane stiffness to increase the symmetric out-of-plane frequency is introduced along with a preliminary analysis of the stiffening effect. A comparison of welded and soldered solar cell interconnections

leads to the conclusion that welding is required on this ultralightweight solar array. The use of a boron/aluminum composite material in a BI-STEM type deployable boom is investigated as a possible advancement in the state-of-the-art. Author

N73-15084# AEG-Telefunken, Hamburg (West Germany).
THE HELIOS SOLAR CELL GENERATOR [DER HELIOS-SOLARZELLEN-GENERATOR]

H. Duerre and B. Goergens 1972 24 p In GERMAN Presented at the 5th DGLR Ann. Meeting, Berlin, 4-6 Oct. 1972
(DGLR-Paper-72-091) Avail: NTIS HC \$3.25

Design and performance of the solar array for the Helios solar probe are discussed. Each of the 32 solar cell panels contains 49% solar cells and 51% second surface mirrors. The temperature qualification range is from -95 C to +200 C. The power requirements range from 240 to 315 W for the complete generator. One of the optimization problems was the soldered contacts of the solar cells, for which a special solution was found. Each solar cell is protected from irradiation by 150 micron thick quartz glass. A series resistance of 0.165 ohms was obtained per cell by dimensional optimization. The design and construction of the solar generator is described. Tests have shown the space applicability of this design. Author (ESRO)

N73-15598*# Scientific Translation Service, Santa Barbara, Calif.
SELECTIVE SURFACES AND COATINGS IN SOLAR RADIATION ENGINEERING

M. M. Koltun Washington NASA Jan. 1973 23 p refs Transl. into ENGLISH from Geliotekh., Akad. Nauk Uzb. SSR (Uzbek SSR), no. 5, 1971 p 70-80

(Contract NASw-2483)

(NASA-TT-F-14650) Avail: NTIS HC \$3.25 CSCL 11C

Literature covering selective coatings for semiconductor photo-converters, for solar energy converters using white-black surfaces, and for cooling systems using solar energy are reviewed. The achievements in this field are summarized as the construction of a theoretical basis for the development of selective surfaces for solar energy conversion, and the fabrication of selective coatings with nearly optimal optical properties for all types of solar energy conversion systems. Author

N73-17911*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.

THE DEVELOPMENT OF A RESIDENTIAL HEATING AND COOLING SYSTEM USING NASA DERIVED TECHNOLOGY
Mark J. O'Neill, A. J. McDaniel, and W. H. Sims Nov. 1972 99 p refs

(Contract NAS8-25986)

(NASA-CR-124063; LMSC/HREC-D306275; HREC-5986-3)
Avail: NTIS HC \$7.00 CSCL 20M

A study to determine the technical and economic feasibility of a solar-powered space heating, air-conditioning, and hot water heating system for residential applications is presented. The basic system utilizes a flat-plate solar collector to process incident solar radiation, a thermal energy storage system to store the collected energy for use during night and heavily overcast periods, and an absorption cycle heat pump for actually heating and cooling the residence. In addition, heat from the energy storage system is used to provide domestic hot water. The analyses of the three major components of the system (the solar collector, the energy storage system, and the heat pump package) are discussed and results are presented. The total system analysis is discussed in detail, including the technical performance of the solar-powered system and a cost comparison between the solar-powered system and a conventional system. The projected applicability of the system to different regions of the nation is described. Author

N73-19059*# Ohio State Univ., Columbus. Electronic Materials and Devices Lab.

EFFECTS OF POSITIVE ION IMPLANTATION INTO ANTI-

REFLECTION COATING OF SILICON SOLAR CELLS Final Report

A. E. Middleton, J. W. Harpster, W. J. Collis, and C. K. Kim
24 Jun. 1971 150 p refs Prepared for JPL
(Contracts NAS7-100; JPL-953042)
(NASA-CR-131090) Avail: NTIS HC \$9.50 CSCL 10A

The state of technological development of Si solar cells for highest obtained efficiency and radiation resistance is summarized. The various theoretical analyses of Si solar cells are reviewed. It is shown that factors controlling blue response are carrier diffusion length, surface recombination, impurity concentration profile in surface region, high level of surface impurity concentration (degeneracy), reflection coefficient of oxide, and absorption coefficient of Si. The theory of ion implantation of charge into the oxide antireflection coating is developed and side effects are discussed. The experimental investigations were directed at determining whether the blue response of Si solar cells could be improved by phosphorus ion charges introduced into the oxide antireflection coating. Author

N73-20044* Globe-Union, Inc., El Monte, Calif. Centralab Semiconductor Div.

DESIGN AND FABRICATION OF WRAPAROUND CONTACT SILICON SOLAR CELLS

G. Goodella 5 Sep. 1972 32 p ref
(Contract NAS3-15345)
(NASA-CR-121003; Rept-6) Avail: NTIS HC \$3.75 CSCL 10A

Work is reported on the development and production of 1,000 N+/P wraparound solar cells of two different design configurations: Design 1, a bar configuration wraparound and Design 2, a corner pad configuration wraparound. The project goal consisted of determining which of the two designs was better with regard to production cost where the typical cost of a conventional solar cell was considered as the norm. Emphasis was also placed on obtaining the highest possible output efficiency, although a minimum efficiency of 10.5% was required. Five hundred cells of Design 1 and 500 cells of Design 2 were fabricated. Design 1 which used similar procedures to those used in the fabrication of conventional cells, was the less expensive with a cost very close to that of a conventional cell. Design 2 was more expensive mainly because the more exotic process procedures used were less developed than those used for Design 1. However, Design 2 processing technology demonstrated a feasibility that should warrant future investigation toward improvement and refinement. Author

N73-20584 National Lending Library for Science and Technology, Boston Spa (England).

THE DAWN OF SOLAR METALLURGY

A. Presnyakov 14 Jul. 1972 3 p Transl. into ENGLISH from Pravda (Moscow), 14 Jul. 1972
(NLL-M-22830-(5828.4F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupon

A vacuum diffusion welding method for joining two different materials is described. The application of solar energy for metallurgical processes is analyzed. It is stated that solar energy can be used to heat any materials, to melt any metals, and to obtain sterile crystals from the metals. The design of a machine for diffusion welding of tubular samples of metal is reported.

Author

N73-21712* Army Foreign Science and Technology Center, Charlottesville, Va.

FILM SOLAR ENERGY COLLECTOR WITH CONCENTRIC CIRCULAR SEAMS

A. Kh. Kamildzhanov 15 Jan. 1973 12 p refs Transl. into ENGLISH from Geliotekh. (USSR), no. 1, 1970
(AD-756829; FSTC-HT-23-1208-72) Avail: NTIS CSCL 13/1

At the present time, plastic films, covered on one side with a thin layer of aluminum, are used as solar energy concentrators in heliotechnology. Commercially produced film is insufficiently

broad to obtain concentrators with large concavities. Therefore, in making concentrators with diameters larger than the film width, their surfaces are glued together from pieces. Thus, concentrators with parallel, radial and circular concentric seams are discussed. The results of experimental investigations of such concentrators was compared with data from investigations of concentrators without seams. Mirror diameters were identical, 0.5m in all variants of the tests, and the width and number of seams were not indicated. Author (GRA)

N73-21959* Royal Aircraft Establishment, Farnborough (England).

STATUS REPORT ON RAE ADVANCED SOLAR ARRAY DEVELOPMENT

F. C. Treble Jul. 1972 31 p refs Presented at the 9th IEEE Photovoltaic Specialists' Conf., Silver Spring, Md., 2-4 May 1972 (RAE-TR-72109; BR-29829) Avail: NTIS HC \$3.75

Recent progress in advanced lightweight solar array technology is reviewed. Solar cell performance has been improved. Panel assemblies embodying a cementless mounting technique have successfully withstood prolonged deep thermal cycling and other environmental tests. Some are currently being flown experimentally on the Prospero technological satellite. A stowed array has survived severe vibration with negligible damage. A solution has been found to the problem of protecting the backs of the cells from low energy protons. Useful experience has been gained in all aspects of the manufacture, handling and testing of flexible folding arrays. Design qualification tests have begun on a 280W prototype. The advantages and disadvantages of this fold-up design in relation to the alternative roll-up type are discussed.

Author (ESRO)

N73-21960* Army Foreign Science and Technology Center, Charlottesville, Va.

HETEROGENEOUS SOLAR CONVERTORS BASED ON POLYCRYSTALLINE CADMIUM SULFIDE AND CADMIUM SELENIDE

V. N. Komashchenko, A. I. Marchenko, and G. A. Fedorus 7 Sep. 1972 11 p refs Transl. into ENGLISH from Poluprov. Tekh. i Mikroelektron. (USSR), no. 4 p 112-121
(AD-756594; FSTC-HT-23-113-72) Avail: NTIS CSCL 20/12

The authors present data on the development and investigation of photoelectric convertors based on pressed sintered tablets of CdS and CdSe, plus somewhat more detailed data on photoelectric convertors based on CdSe films. GRA

N73-21973* Army Foreign Science and Technology Center, Charlottesville, Va.

SPACE ELECTRIC POWER PLANTS. PART 2

M. Korolev 7 Feb. 1973 7 p Transl. into ENGLISH from Pravda (Moscow), no. 181, 10 Jun. 1971 p 3
(AD-756039; FSTC-HT-23-921-72) Avail: NTIS CSCL 10/2

Solar batteries and power cells are discussed. 7,500 photocells comprising a panel 1 meter square generate more than 100 watts of electrical energy. Space service life of certain semiconductors is given as two to three years. Glass coatings protect panels from heavy protons. Reference is made to the Boeing Co. project of unfolding glass fabric panels for space use. Korolev also states that Soviet scientists confirm the feasibility of such a project but claim that it will be surpassed. Thin film highly efficient photocell panels have been developed in the USSR. Reference is made to an unspecified plant/factory which manufactures not only space power units (using solar energy) but ground solar power plants as well. A 800 watt pilot installation has been in operation in the Karakum desert. Author (GRA)

N73-22748* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THE UTILIZATION OF SOLAR ENERGY TO HELP MEET OUR NATION'S ENERGY NEEDS

Ronald L. Thomas 1973 37 p refs Presented at Energy Crisis Symp., Albuquerque, 3-4 May 1973; sponsored by Natl.

02 SOLAR ENERGY

Profess. Soc. of N. Mex.

(NASA-TM-X-68230; E-7439) Avail: NTIS HC \$4.00 CSCL 10A

The nation's energy needs, domestic energy resources, and possible future energy resources are briefly discussed in this paper. Three potential solutions, coal, nuclear and solar are compared as to benefits and problems. The paper primarily discusses the options available in using solar energy as a natural energy resource. These options are discussed under the generation of electricity, heating and cooling of buildings, and the production of clean fuel. Author

N73-23015# Army Foreign Science and Technology Center, Charlottesville, Va.

PERFORMANCE RELIABILITY CALCULATION FOR A MODULAR SOLAR THERMOELECTRIC GENERATOR

Yu. N. Malevskii 10 Jan. 1973 9 p refs Transl. into ENGLISH from *Geliotekhnika*, Akad. Nauk Uz. SSR (Tashkent), no. 1, 1971 p 16-20

(AD-757087; FSTC-HT-23-1434-72) Avail: NTIS CSCL 10/2

Analysis is given of the overall reliability of a solar energy converter unit composed of thermoelectric modules, as a function of the reliability of individual photocells and component modules. Expressions are given to determine the reliability of various module circuit designs having the modules in series, parallel and combined connections. The usefulness of redundancy in these designs is noted. Suggestions are given concerning the selection of module circuit designs most suitable for given operational requirements. Author (GRA)

N73-25104# Army Foreign Science and Technology Center, Charlottesville, Va.

CALCULATION AND COST OPTIMIZATION OF CERTAIN SOLAR GENERATOR THERMOBATTERY PARAMETERS

L. M. Drabkin 12 Jan. 1973 12 p refs Transl. into ENGLISH from *Geliotekhnika*, Akad. Nauk Uz. SSR (Tashkent), no. 1, 1971 p 9-15

(AD-759812; FSTC-HT-23-1433-72) Avail: NTIS CSCL 10/2

A method for economic analysis of thermoelectric generators is discussed in the Russian report. A formula is presented which permits calculation of the cost of manufacture of a thermoelectric generator thermobattery (if material outlay on it is known). From the formula proposed, it follows in particular that, with a decrease in the weight of materials, the cost of a battery decreases linearly. However, with a decrease in the weight of materials (thickness of thermoelements), the number of thermoelements per watt generated grows, approaching infinity. Wage expenditures also increase considerably here. The formula does not take all factors into account, and it is impossible to build up a method for optimizing thermobattery construction parameter design, especially for the solar thermoelectric generator. (Author Modified Abstract) GRA

N73-26818# Maryland Univ., College Park. Dept. of Mechanical Engineering.

AN ASSESSMENT OF SOLAR ENERGY AS A NATIONAL ENERGY RESOURCE

Paul Donovan, William Woodward, William E. Cherry, Frederick H. Morse, and Lloyd O. Herwig Dec. 1972 89 p refs Sponsored by NASA and NSF

(NASA-CR-133101) Avail: NTIS HC \$6.50 CSCL 10A

The applications are discussed of solar energy for thermal energy for buildings; chemical and biological conversion of organic materials to liquid, solid, and gaseous fuels; and the generation of electricity. It is concluded that if solar development programs are successful, building heating for public use is possible within 5 years, building cooling in 6 to 10 years, synthetic fuels from organic materials in 5 to 8 years, and electricity production in 10 to 15 years. F.O.B.

N73-26976# Scientific Translation Service, Santa Barbara, Calif.

LUMIDUC ARCHITECTURE

Guy Rottier Washington NASA 29 Jun. 1973 11 p Transl. into ENGLISH from the French report Bull-22

(Contract NASw-2483)

(NASA-TT-F-14983; Bull-22) Avail: NTIS HC \$3.00 CSCL 13B

A new concept of architecture for urban design is discussed. The design enables solar rays to be captured and directed by means of reflection through channels to the interior of a dwelling, thereby foregoing the necessity of rooms having an outside exposure for solar illumination. Author

N73-30057# Lockheed Missiles and Space Co., Sunnyvale, Calif.

SPACE STATION SOLAR ARRAY TECHNOLOGY EVALUATION PROGRAM Final Report

F. V. Bischof Feb. 1973 138 p

(Contract NAS9-11039)

(MSC-07163) Avail: NTIS HC \$9.00 CSCL 10A

The results of all the major program phases of the program are reported. All goals of the program, which are listed were successfully accomplished and are briefly described. A complete list is included of all drawings generated during this program. Author

N73-30977# Ion Physics Corp., Burlington, Mass.

DEVELOPMENT OF GALLIUM ARSENIDE SOLAR CELLS Final Report

Feb. 1973 43 p refs Sponsored by NASA, Prepared by JPL

(Contract JPL-953270)

(NASA-CR-135510) Avail: NTIS HC \$4.25 CSCL 10A

The potential of ion implantation as a means of developing gallium arsenide solar cells with high efficiency performance was investigated. Computer calculations on gallium arsenide cell characteristics are presented to show the effects of surface recombination, junction space-charge recombination, and built-in fields produced by nonuniform doping of the surface region. The fabrication technology is summarized. Electrical and optical measurements on samples of solar cells are included. Author

N73-30982# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.

LITHIUM-DOPED SILICON SOLAR CELLS STATE-OF-THE-ART Technical Report, Apr. - Oct. 1972

John M. Green Jun. 1973 43 p refs

(AF Proj. 3145)

(AD-764357; AFAPL-TR-73-4) Avail: NTIS CSCL 10/2

The present status of lithium-doped solar cells was investigated. Improvements in fabrication techniques have made possible lithium-doped cells which are 11.9% efficient at AMO conditions and 28 C. Cell areas of 12 square centimeters are now feasible. Annealing characteristics are highly temperature dependent with 60 C being the minimum array temperature for good performance. If the recovered power levels for N/P cells and P/N lithium-doped cells are compared for an array temperature of 80 C, it is found that the P/N lithium-doped cells are 15% higher after 10 to the 15th power/sq cm 1 Mev equivalent electrons and 85% higher after 10 to the 13th power/sq cm fission spectrum neutrons. Based on this survey the use of lithium-doped cells is recommended for missions which require solar arrays to operate at temperatures above 60 C, especially if the satellite must survive a nuclear weapon environment. Author (GRA)

N73-32655# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

FLAT-PLATE COLLECTOR PERFORMANCE EVALUATION. THE CASE FOR A SOLAR SIMULATION APPROACH

F. F. Simon and Paul Harlamert 1973 21 p refs Presented at Intern. Solar Energy Soc., Cleveland, 3-4 Oct. 1973

(NASA-TM-X-71427; E-7670) Avail: NTIS HC \$3.25 CSCL 03B

A method is proposed for determining the performance of flat-plate solar collector using a simulated sun. Collector test variables that will help establish the basis for the indoor test facility at the Lewis Research Center are discussed. The use of the indoor testing should permit a standard test for the convenient and accurate determination of collector performance. Preliminary test results are reported as an example of the type of collector performance data to be expected from the simulation approach.

Author

N73-33007# Sandia Labs., Albuquerque, N.Mex.
ANALYSIS OF LINEAR FOCUSED COLLECTORS FOR SOLAR POWER

R. B. Pope and W. P. Schimmel, Jr. 1972 7 p refs Sponsored by AEC

(SLA-73-5319; Conf-730811-6) Avail: NTIS HC \$3.00

The use of linear focused collectors to collect solar energy in a high-quality (high-temperature) state is analytically studied. The effects of variations in concentration, absorptance, and emittance of the receiver, silvering of the envelope, and system geometry are considered. Convective and radiative transport between the receiver and envelope and from the envelope to the environment are modeled. Radiative exchange processes are modeled with an approximate two-wavelength band model. Calculated results are presented for varying values of specular solar input, linear aperture, concentration, absorptance, emittance, collection temperatures, for both silvered and unsilvered envelopes, and for both evacuated and unevacuated cavities. The study indicates that collector extraction efficiencies of 40 to 60% can be reasonably expected. Highly selective surfaces are relatively unimportant for values of X greater than about 30 if the envelope is silvered. Collector efficiency is increased with increasing linear aperture. The studies indicate that efficient focused collectors providing highquality energy can probably be constructed with available technology.

NSA

N73-33011# Army Foreign Science and Technology Center, Charlottesville, Va.

SOLAR AND WIND POWER TO BE HARNESSSED

Ya. Shefter, G. Aleksenko, N. Lidorenko, S. Iosipyan, and A. Shakhov 1 Nov. 1972 6 p Transl. into ENGLISH from Pravda (Moscow), 11 May 1971 p 3

(AD-765783; FSTC-HT-23-922-72) Avail: NTIS CSCL 10/2

The state-of-the-art of wind and solar power installations are discussed.

GRA

N73-33762# Cooperation Mediterraneenne pour l'Energie Solaire, Marseille (France).

MEDITERRANEAN COOPERATION FOR SOLAR ENERGY, BULLETIN NO. 22 [COOPERATION MEDITERRANEENNE POUR L'ENERGIE SOLAIRE, BULLETIN NO. 22]

Mar. 1972 91 p refs In FRENCH

(Bull-22) Avail: NTIS HC \$6.75

Conference data on the use of solar energy in the Mediterranean are presented. Various techniques and equipment are also described.

N73-33767 Cooperation Mediterraneenne pour l'Energie Solaire, Marseille (France).

REFLECTIONS ON HELIOTHERMIC TRANSFORMATION OF DIRECT SOLAR RADIATION [REFLEXIONS SUR LA TRANSFORMATION HELIOTHERMIQUE SOUS RAYONNEMENT CONCENTRE]

A. Hima and D. Pailharey *In its* Mediterranean Cooperation for Solar Energy, Bull. no. 22 Mar. 1972 p 27-34 refs In FRENCH

Heliothermic transformation of solar electromagnetic radiation so that it can be used for heating purposes is discussed. Specifically, theories and formulas are proposed to aid in fabricating equipment to convert direct solar energy into heat for industrial use.

Transl. by E.H.W.

N73-33763 Cooperation Mediterraneenne pour l'Energie Solaire, Marseille (France).

NEW HELIOTECHNIQUE (LA NOUVELLE HELIOTECHNIQUE)

M. Touchais *In its* Mediterranean Cooperation for Solar Energy, Bull. no. 22 Mar. 1972 p 5-7 In FRENCH

Utilization of solar energy on earth using an old and new heliotechnique is discussed. Data cover industrial applications and light and heat sources for homes. The economics of using solar energy is also examined.

Transl. by E.H.W.

03 OTHER PRIMARY ENERGY SOURCES

Includes petroleum and oil, coal, shale, natural gas; nuclear fuel; wind power, geothermal energy, remote sensing of energy resources.

A68-21940 #

ECOLOGICAL SIGNIFICANCE OF WASTE HEAT UTILIZATION. Alfred A. Bacher (Department of the Interior, Office of Saline Water, Washington, D.C.) and Samuel A. Zwickler (Burns and Roe, Inc., New York, N.Y.).

IN: ECOLOGICAL TECHNOLOGY: SPACE-EARTH-SEA. VOLUME 1 - TECHNOLOGICAL TRANSFERENCE SYMPOSIUM, 1ST, SMITHSONIAN INSTITUTION, WASHINGTON, D.C., FEBRUARY 14, 15, 1966, PROCEEDINGS.

Symposium sponsored by the National Cybernetics Foundation. Edited by E. B. Konecni.

Austin, Tex., University of Texas (Transference of Technology Series No. 1), 1967, p. 197-221.

Discussion of actual and planned methods for the utilization of waste heat generated by the combustion of rubbish and by industrial furnaces, electrical fixtures, and human beings. Some of the uses to which this surplus heat could be put include the distillation of sea water and the heating of industrial buildings. R. B. S.

A68-23286 *

NUCLEI OF PLEOCHROIC HALOS IN BIOTITES OF SOME SIERRA NEVADA GRANITIC ROCKS.

Kenneth G. Snetsinger (NASA, Ames Research Center, Space Sciences Div., Moffett Field, Calif.).

American Mineralogist, vol. 52, Nov.-Dec. 1967, p. 1902, 1903. 13 refs.

Study of the halos in some Sierra Nevada granites in order to obtain data regarding the nuclei in the biotite of these rocks. The relationship between the zircon content of the biotites and the production of halos in these structures is investigated. R. B. S.

A68-27231 *

ANALYSIS OF THE MINERAL ENTRAPPED FATTY ACIDS ISOLATED FROM THE GREEN RIVER FORMATION.

A. L. Burlingame and B. R. Simoneit (California, University, Dept. of Chemistry and Space Sciences Laboratory, Berkeley, Calif.). Nature, vol. 218, Apr. 20, 1968, p. 252-256. 21 refs. NASA-supported research.

Analysis of the organic acids liberated after demineralization of the exhaustively extracted oil shale of the Green River Formation. The families of acidic components which were found were the same as those reported in the solvent soluble fraction of the oil shale by Haug et al. (1967, 1968). The relative concentrations differed widely, however, and some distributions within homologous series varied, probably as a result of solubility properties in their isolation. M.F.

A68-30437

PUT GEOLOGY SURVEYS IN ORBIT TO FIND OIL.

Frank J. Wobber (International Business Machines Corp., Federal Systems Div., Space Systems Center, Bethesda, Md.). Oil and Gas Journal, Dec. 11, 1967. 5 p.

Suggestion that Gemini photographs offer some insight to the use of space photography as a tool for the petroleum industry, and especially for geologists involved in regional mapping or modern environmental research. The advantages of orbital surveys are the collection of synoptic worldwide data and the opportunity for reconnaissance mapping without political-boundary restrictions. A closer examination of cloud-free Gemini photographs obtained over low-latitude deserts in North Africa and the Mideast shows that sand provenance areas, aeolian processes, and topographical factors related to dune migration and orientation can be speedily detected, leading to a deeper understanding of the origin, developments, and changing morphology of desert dunes. P.v.T.

A68-33439

THE POTENTIAL OF METHANE AS A FUEL FOR ADVANCED AIRCRAFT.

C. L. Joslin (United Aircraft Corp., Pratt and Whitney Aircraft Div., Florida Research and Development Center, West Palm Beach, Fla.).

IN: AVIATION AND SPACE: PROGRESS AND PROSPECTS; PROCEEDINGS OF THE ANNUAL AVIATION AND SPACE CONFERENCE, BEVERLY HILLS, CALIF., JUNE 16-19, 1968.

New York, American Society of Mechanical Engineers, 1968, p. 351-355.

Discussion of the potential benefits of methane as a fuel for advanced aircraft, and comparison of methane and standard JP fuels as to performance, economy, combustion and heat transfer, and handling. Benefits associated with the use of methane include greater availability, lower cost, reduced IR signature, elimination of smoke, increased engine life, improved specific fuel consumption, and better engine power-to-weight ratio. Safety aspects and foreseeable problem areas associated with the use of methane are also discussed. M.G.

A68-35741

GAS TURBINE FUELS.

Herbert R. Hazard.

IN: GAS TURBINE ENGINEERING HANDBOOK (1st Edition).

Edited by J. W. Sawyer.

Stamford, Conn., Gas Turbine Publications, Inc., 1966, p. 172-182. 10 refs.

Evaluation of gas-turbine fuels, emphasizing the difference between aircraft fuels and industrial fuel requirements. Aircraft fuels have properties which have been selected and compromised to provide excellent long-term storage, characteristics suitable for pumping, filtration, metering, and atomization at high altitudes and low ambient temperatures, good combustion characteristics, and availability in substantial quantities at moderate cost. They differ from commercial diesel or burner fuels in having lower freezing points, lower aromatic content, and special luminosity characteristics. Fuels for industrial gas turbines are selected almost entirely on the basis of economics. In order of importance, the most common fuels are natural gas, petroleum distillates, refinery and chemical-plant gases and liquids, and residual fuel oil. Efforts to develop a commercial specification for a low-sodium residual fuel oil for gas-turbine use are now in progress. P.v.T.

A68-41768

THE LUBRICITY CHARACTERISTICS OF HEAVY AROMATICS.

J. K. Appeldoorn and F. F. Tao (Esso Research and Engineering Co., Linden, N.J.).

Wear, vol. 12, Aug. 1968, p. 117-130. 5 refs.

USAF-supported research.

Discussion of the influence of heavy aromatics on the lubricity of petroleum oils. Heavy aromatic hydrocarbons are the most probable cause of the good lubricating characteristics of petroleum oils. As little as 2% can greatly reduce wear and friction and increase the load-carrying capacity of paraffins. These mixtures of heavy aromatics and paraffins are much better than either component alone. Condensed-ring heavy aromatics have a second unusual behavior: in the absence of water and oxygen they will scuff at very low loads. The unusual behavior of the heavy aromatics is attributed to a little-understood decomposition reaction at the rubbing surface and not to oxidation or reaction with the metal. Z. W.

A68-43667

POWER GENERATION FOR AIRCRAFT IN THE SECOND CENTURY.

M. W. Thring (London, University, Queen Mary College, London, England).

Aeronautical Journal, vol. 72, Sept. 1968, p. 735-738. 9 refs.

Consideration of power generation for civilian aircraft in terms of what kind of flying people will want to do in the second century of powered flight. The predictable primary power sources are fossil chemical fuels, nuclear fuels, and solar energy. Future transport possibilities are outlined. These include air-cushion vehicles, a helium-filled airship, overhead monorails, and various types of

03 OTHER PRIMARY ENERGY SOURCES

winged aircraft. It is considered that portable hydrocarbon fuels will be available for all the transport needs for perhaps fifty years. Attention is given to possible developments in chemical fuels, and to advanced power systems. F. R. L.

A68-44446 **

A REVIEW OF THE POTENTIAL OF LIQUID-METHANE FUEL FOR SUPERSONIC TRANSPORTS. Richard J. Weber (NASA, Lewis Research Center, Mission Analysis Branch, Cleveland, Ohio).

National Academy of Sciences, Cryogenic Engineering Conference, Cleveland, Ohio, Aug. 19-21, 1968, Paper. 16 p. 9 refs.

Review of the potential of liquid methane as a fuel for supersonic aircraft by comparing it with conventional kerosene. The use of methane rather than kerosene is discussed in terms of engine performance and aircraft design. It is pointed out that the current demand to limit engine noise tends to nullify the utility of methane's superior cooling capacity. Substitution of liquid methane fuel for conventional kerosene promises reductions in direct operating cost of 30% or more. The disadvantages of liquid methane are its low density and low boiling point. The importance of minimizing boiloff is emphasized, and techniques for treating the problem of pressure-induced boiloff are studied. M. F. J.

A68-44975

ACTIVE COOLING OF A HYDROGEN FUELED SCRAMJET ENGINE. L. L. Pagel and W. R. Warmbold (McDonnell Douglas Corp., McDonnell Aircraft Co., St. Louis, Mo.).

American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1091. 9 p.

Members, \$1.00; nonmembers, \$1.50.

Analytical studies were performed to determine engine cooling requirements for a scramjet powered, high-altitude cruise aircraft. A comparison of active cooling concepts resulted in the selection of a regenerative system using superalloy heat exchangers and the hydrogen fuel as coolant. This approach resulted in efficient operation (i. e., equivalence ratios of less than one) at flight speeds of Mach 12 or greater. Internal aerodynamic heating rates were predicted by the reference enthalpy turbulent heating correlation and increased locally to account for shock/boundary layer interaction effects. Coolant side heat transfer analyses were performed to determine near optimum heat exchanger core geometry. Sensitivity studies established the relationship between engine cooling requirements and key parameters for a representative aircraft. (Author)

A68-45023

ENDOTHERMIC FUELS FOR HYPERSONIC VEHICLES.

H. Lander (USAF, Systems Command, Research and Technology Div., Aero Propulsion Laboratory, Support Technology Div., Fuels, Lubrication and Hazards Branch, Wright-Patterson AFB, Ohio) and A. C. Nixon (Shell Oil Co., Shell Development Co., Chemical Engineering Dept., Emeryville, Calif.).

American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-997. 13 p. 15 refs.

Members, \$1.00; nonmembers, \$1.50.

USAF-sponsored research.

Study of the use of hydrocarbon fuels for cooling in hypersonic vehicles. In order to achieve maximum heat sinks, endothermic reactions must be employed to augment fuel enthalpy. These reactions include thermal cracking, depolymerization, dehydrogenation, and dehydrocyclization. Of these the catalytic dehydrogenation of naphthenes shows the most promise for practical application. The dehydrogenation of MCH over a Pt/Al₂O₃ catalyst can approximately double the 1000 Btu/lb available from fuel enthalpy. This should provide cooling sufficient to allow flight into the range of Mach 10 at optimum altitude. Factors which are important in this consideration such as thermal stability, reaction range, reactor weight and volume heat transfer, pressure drop, combustion characteristics, and the mating of the cooling system to the aircraft are discussed. Research directions to be pursued in future studies are indicated. P. v. T.

A69-19456

EFFECT OF SULFIDES CONTAINED IN FUELS ON THEIR OPERATIONAL PROPERTIES [VLIANIE SUL'FIDOV, SODER-ZHASHCHIKHSIA V TOPLIVAKH, NA IKH EKSPLOATATSION-NYE SVOISTVA].

Ia. B. Chertkov, V. G. Spirkin, and S. G. Klimov.

Khimiia i Tekhnologiya Topliv i Masel, vol. 14, no. 1, 1969, p. 50-53. In Russian.

Study of the effect of petroleum sulfides present in distillates with intermediate boiling points on the oxygen consumption during combustion. It is found that petroleum sulfides are effective anti-oxidizers with respect to these fuels. Since they act as natural inhibitors, their presence should be regarded as advantageous. The effect of petroleum sulfides should be considered after solving the problem of decontamination of distillates from sulfur compounds. Z. W.

A69-23975

AN IMPROVED VISCOSITY-TEMPERATURE CHART FOR HYDROCARBONS.

W. A. Wright (Sun Oil Co., Marcus Hook, Pa.).

Journal of Materials, vol. 4, Mar. 1969, p. 19-27. 14 refs.

A new viscosity-temperature chart for hydrocarbons is presented. It has greatly improved linearity and useful range as compared to the present ASTM Designation D 341 and others which have been proposed from time to time. The new mathematical expression has been derived empirically from current data on both pure hydrocarbons and petroleum fractions. It is demonstrated that the improved chart will permit reliable linear extrapolations into low-viscosity, high-temperature regions which were not possible previously. (Author)

A69-33265

ANALYTICAL STUDY OF CATALYTIC REACTORS WHICH PROMOTE ENDOTHERMIC REACTIONS OF HYDROCARBON FUELS.

Arthur S. Kesten (United Aircraft Corp., United Aircraft Research Laboratories, East Hartford, Conn.).

American Institute of Aeronautics and Astronautics, Thermophysics Conference, 4th, San Francisco, Calif., June 16-18, 1969, Paper 69-588. 7 p. 9 refs.

Members, \$1.00; nonmembers, \$1.50.

Experimental demonstration of the cooling capabilities of catalytic reactors which promote endothermic reactions of hydrocarbon fuels, using the dehydrogenation of methylcyclohexane (MCH) fuel over a platinum on alumina catalyst. A computer program has also been formulated to describe the steady-state behavior of these packed-bed reactors by computing temperature and composition profiles in a homogeneous mixture of vapor and catalyst particles. A more comprehensive theoretical analysis, previously developed to describe the behavior of adiabatic, constant-pressure packed-bed reactors, was modified for application to the MCH system. This analysis considers the effects of heat and mass diffusion on reaction rates in porous catalyst particles. The effects of catalyst pore size on temperature and fractional MCH conversion profiles are illustrated for various operating temperatures. M. M.

A69-38458

THERMOELECTRIC GENERATORS HEATED BY RADIOISOTOPES (LES GENERATEURS THERMOELECTRIQUES CHAUFES AUX RADIOISOTOPES).

Michel Alais (Société Alsacienne de Constructions Atomiques, de Télécommunications et d'Electronique, Paris, France).

Entropie, May-June 1969, p. 21-27. In French.

Description of the Gisete 5, an electrically heated, radioisotopic generator for submarine use, at depths of 200 m. The 15-W generator uses a source of 80,000 curies of strontium 90. Criteria for the choice of the isotopic source are presented, and a table giving the characteristics of a number of radio elements suitable for use as a power source for generators is included. The choice of a charge of strontium 90 is based on its availability as a product of uranium fission and its insolubility under water. In addition, it represents the best compromise of all the elements considered, in terms of periodicity and specific power. A test is reported showing that a slight augmentation of the power source makes it possible to achieve 20 W of electricity at 24 V. B.H.

A69-43142

RANGE AND FLIGHT ECONOMY OF POWER GLIDERS (REICHWEITE UND FLUGÖKONOMIE VON MOTORSEGLERN). Nils Hiorth.

Deutscher Aerokurier, vol. 13, Sept. 1969, p. 602, 603. In German.

Derivation of formulas for calculating the flight range and fuel consumption of power gliders when used for transportation rather than competitive purposes. Applying these formulas to a suitable example, the calculations show that power gliders are appreciably more economical than automobiles. V.P.

A70-12516 *

APPLICATION OF GAS CHROMATOGRAPHY AND MASS SPECTROMETRY TO PORPHYRIN MICROANALYSIS—A STUDY OF HOMOLOGOUS PORPHYRIN SERIES IN ANCIENT BIOLOGICAL RESIDUES.

David B. Boylan, Yousif I. Alturki, and Geoffrey Eglinton (Bristol, University, School of Chemistry, Organic Geochemistry Unit, Bristol, England).

IN: ADVANCES IN ORGANIC GEOCHEMISTRY FOR 1968.

Edited by P. A. Shenk and I. Havenaar.

Braunschweig, F. Vieweg, 1969, p. 227-239; Discussion, W. G. Meinschein, A. L. Burlingame, E. V. Whitehead, and W. Heller, p. 239, 240. 6 refs.

Grant No. NGL-05-003-003.

Recent advances have concerned the conversion of porphyrin pigments to volatile bis (trimethylsiloxy) silicon complexes that can be gas chromatographed under normal conditions. These techniques have been applied to the analysis of homologous series of porphyrins such as are found in recent and ancient sediments and oils. Gas chromatographic and mass spectrometric analysis of GC fractions of the Boscan petroporphyrins are discussed and compared with results obtained from a preliminary analysis of Green River shale porphyrins. (Author)

A70-25897

Bureau of Mines—API survey of aviation gasolines, 1969. C. M. McKinney and O. C. Blade (U.S. Bureau of Mines, Washington, D.C.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 18-20, 1970, Paper 700228*. 7 p. Members, \$1.00; nonmembers, \$1.50.

Tabulation of the inspection data for 67 samples of three grades (80/87, 100/130, and 115/145) of commercial aviation gasolines produced in the United States during 1969. The results are compared with similar data for gasolines produced during 1964, the last year for which such data are available, and with recently revised specification requirements of the ASTM. Z.W.

A70-29999

Aviation fuels and lubricants (Flugkraftstoffe und Flugschmierstoffe). Günter Spengler (München, Technische Hochschule; Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugtrieb- und Schmierstoffe; Landesgewerbeamt Bayern, München, West Germany) and Heinz Beck (Zentralstelle für Luftfahrtokumentation und -information, Munich, West Germany). *VDI-Z*, vol. 112, no. 9, 1970, p. 584, 585. 35 refs. In German.

Review of present and expected future trends in aviation fuels and lubricants. The stringent requirements of SST aircraft and the changes in fuels and lubricants designed to meet the new needs are discussed, along with fire-hazard and pollution minimization measures. M.V.E.

A70-36657 #

Employment of LPG as fuel in a fuel cell (Sull'impiego del GPL come combustibile in una fuel-cell). Giancarlo Ferrari (CNR, Rome, Italy). *Istituto Internazionale delle Comunicazioni, Convegno Internazionale delle Comunicazioni, 17th, Genoa, Italy, Oct. 8-12, 1969, Paper*. 25 p. 10 refs. In Italian.

Investigation of the possibility of using LPG as a fuel cell fuel for powering both civil and military vehicles, for marine propulsion, and for the implementation of transportable power generators for manifold applications. It is shown that a specific system using LPG as a fuel cell fuel is definitely competitive from the efficiency standpoint with conventional power generators compared to which, however, it has a greater weight and overall dimensions. M.M.

A70-43439 #

Gas turbine cycle calculations - The effects of fuel composition and heat of combustion. T. A. P. S. Appa Rao and E. P. Cockshutt (National Research Council, Ottawa, Canada). *CASI Transactions*, vol. 3, Sept. 1970, p. 162-169. 10 refs.

A procedure has been developed for the calculation of gas turbine cycles using a general hydrocarbon as the fuel. Computer programs have been developed to facilitate the calculations, by suitably modifying existing ones previously developed at the National Research Council, Ottawa. Using these programs, the effects of changes in the fuel composition and heat of combustion on the performance of typical turbojet, turbofan, turboprop and turboshaft cycles were studied. The performance of different fuels was compared with Standard Fuel performance. It is shown that thermal efficiency is a better performance criterion than specific fuel consumption, if fuel composition is a significant variable in cycle studies. Thermal efficiency and specific power may in many cases be computed with Standard Fuel without significant loss of accuracy; this applies for fuels with H/C ratios lying between 1.8 and 2.05 (or heating values between 10,200 CHU/lb. and 10,450 CHU/lb.) and thus embraces all common aircraft fuels plus many vehicular and industrial fuels. (Author)

A71-17433 #

Chemical stabilization of engine and jet fuels (Khimicheskaya stabilizatsiya motornykh i reaktivnykh topliv). M. F. Vol'f. Moscow, Izdatel'stvo Khimii, 1970. 373 p. 620 refs. In Russian.

Problems associated with the chemical stabilization automobile and aircraft ethylated gasolines and jet and diesel fuels during storage, transportation, and utilization are discussed. Domestic and foreign experience in improving fuel stabilization by such additions as antioxidantizing and dispersing agents and deactivators of metals is reviewed. Techniques used for introducing chemical additions to the fuels are examined, together with accepted methods of testing and evaluating the stability of gasolines and jet and diesel fuels. The book is intended for scientists and engineers employed in the petroleum industry, and for individuals specializing in storing fuels. V.P.

A71-24239

Development of a single-grade general aviation avgas. H. J. Foster and L. G. Olson (Shell Oil Co., Houston, Tex.). *Society of Automotive Engineers, National Business Aircraft Meeting, Wichita, Kan., Mar. 24-26, 1971, Paper 710369*. 14 p. Members, \$1.00; nonmembers, \$1.50.

To verify the practicality of a single-grade general aviation avgas which would meet the needs of engines using grade 80/87 and 100/130 fuel, a flight evaluation was conducted in selected light aircraft. Some 2200 hr of actual flight operation demonstrated the acceptability of this fuel for grade 80/87 certificated aircraft, together with a performance advantage for grade 100/130 users. (Author)

A71-24852 #

Endothermic fuels for hypersonic vehicles. H. Lander (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio) and A. C. Nixon (Shell Development Co., Emeryville, Calif.). (*American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-997*.) *Journal of Aircraft*, vol. 8, Apr. 1971, p. 200-207. 15 refs. USAF-sponsored research.

Study of the use of hydrocarbon fuels for cooling in hypersonic vehicles. In order to achieve maximum heat sinks, endothermic reactions must be employed to augment fuel enthalpy. These reactions include thermal cracking, depolymerization, dehydrogenation, and dehydrocyclization. Of these the catalytic dehydrogenation of naphthenes shows the most promise for practical application. The dehydrogenation of MCH over a Pt/Al₂O₃ catalyst can approximately double the 1000 Btu/lb available from fuel enthalpy. This should provide cooling sufficient to allow flight into the range of Mach 10 at optimum altitude. Factors which are important in this consideration such as thermal stability, reaction range, reactor weight and volume, heat transfer, pressure drop, combustion character, etc., and the mating of the cooling system to the aircraft are discussed. Research directions to be pursued in future studies are indicated. P.v.T.

03 OTHER PRIMARY ENERGY SOURCES

A71-28754 **Fuels for aircraft gas turbine engines.** A. Lewis (Shell Research, Ltd., Thornton Research Centre, Chester, England). In: *Combustion and heat transfer in gas turbine systems: Proceedings of an International Propulsion Symposium, College of Aeronautics, Cranfield, Beds., England, April 15-17, 1969.* Edited by E. R. Norster. Oxford, Pergamon Press, Ltd. (Cranfield International Symposium Series. Volume 11), 1971, p. 309-323; Discussion, p. 324, 325. 11 refs.

Consideration of kerosene-type fuels meeting either the British D.Eng.R.D.2494 specifications or the ASTM Jet A or A-1 specifications. These fuels are produced mainly by straightforward distillation processes, with subsequent treatments to remove sulfur and trace components. Combustion problems with either type of fuel have been largely eliminated by the progressive development of the engines although there is a growing preoccupation with the formation and emission of smoke during takeoff and landing. The trend of fuel injection systems is towards greater use of air assistance in atomization and the possible use of fuel vaporization. The possibility of fuel additives for reducing smoke emission is discussed. The problems of bacterial or fungal contamination of aircraft fuel systems still exist. F.R.L.

A71-33291 **Bayesian decision theory - Promise and problems.** Arthur M. Breipohl (Kansas, University, Lawrence, Kan.). In: *Annals of reliability and maintainability. Volume 10 - Assurance technology relates to today's world; Proceedings of the Tenth Reliability and Maintainability Conference, Anaheim, Calif., June 27-30, 1971.* Conference sponsored by the American Society of Mechanical Engineers, the Society of Automotive Engineers, and the American Institute of Aeronautics and Astronautics. New York, American Society of Mechanical Engineers, 1971, p. 49-52. 7 refs.

Elementary examples with gross abstractions of real problems are treated to assess the qualities of the Bayesian decision theory in treating decision problems. The constituents of a decision problem are displayed in discussing the choice of three possible systems to convert wind into electrical energy. The current power vs pollution problem is abstracted into a decision theory context to illustrate some of the difficulties involved in the decision theory. V.Z.

A71-38076 * **Combustion Institute, Symposium (International) on Combustion, 13th, University of Utah, Salt Lake City, Utah, August 23-29, 1970, Proceedings.** Symposium supported by the National Science Foundation, NSF Grant No. K-016286; the U.S. Air Force, Contract No. AF 44(620)-70-C-0075; the U.S. Navy, Contract No. N 00014-70-C-0075; NASA, Contract No. NSR-39-003-008; and the U.S. Army, Grant No. DA-ARO(D)-31-124-70-685. Pittsburgh, Combustion Institute, 1971. 1126 p. Members, \$25.; nonmembers, \$48.

Combustion and fundamental flame phenomena served as one major theme, while the applications of combustion, with particular emphasis on fire hazards and pollution, served as the second. This combination of topics emphasized the challenge of providing the methods necessary to achieve maximum utilization of fuel resources with minimum contamination and modification of the environment. The fields covered were the kinetics of elementary chemical reactions; chemical kinetics in shock tubes; low-temperature oxidation of hydrocarbons; chemi-ionization and electrical properties of flames; air pollution; engine combustion and emissions; oscillatory combustion; laminar and turbulent flame propagation; flame structure and flames involving halogens; ignition; liquid and vapor diffusion flames; metal particle combustion; combustion of solid organic materials; fire spread; solid-propellant combustion; and detonation. Comprehensive author and subject indexes are provided. F.R.L.

A71-38948 * **Radioisotopes: Famine or feast - A review of availability.** James C. Graf and Paul E. Brown (General Electric Co., Space Div., Philadelphia, Pa.). In: *Society of Automotive Engineers*

Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings. Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 918-932. 28 refs. Contract No. NAS 9-11343.

To be of use as an energy source in power conversion systems, a radioisotope must be available in the quantity and form required for the application. Although the AEC currently remains the major source of radioisotopes for conversion systems, the proliferation of commercial nuclear power reactors in the next 10 years will generate large quantities of fission products and transuranium elements as by-products of operation which can potentially be recovered and used. The nuclear and radiation properties of these nuclides, and the thermal characteristics of the most probable chemical form of each are briefly described, together with the limitations on usefulness imposed by specific power, half-life, and other factors. The projected availability of a number of these isotopes and their possible costs are assessed. M.M.

A72-15743 # **Determination of heat losses in an oil well during the injection of a hot liquid in the stratum (Sur la détermination des pertes de chaleur dans un puits de pétrole pendant l'injection d'un liquide chaud dans le gisement).** T. Oroveanu (Institut de Pétrole, Ploiești, Rumania). *Revue Roumaine des Sciences Techniques, Série de Mécanique Appliquée*, vol. 16, no. 6, 1971, p. 1193-1206. 5 refs. In French.

This investigation was made during the injection of a heated liquid into the layer. Such a process is used to enhance the effectiveness of the oil displacement toward the extraction well. The formulas known in the specialized literature which allow the calculation of these losses are deduced starting from very elementary considerations with the aim of establishing a more rigorous computation process. An attempt in this respect was made by Oroveanu (1971) by averaging certain approximations imposed by the complexity of the problem and by the necessity of finding a very simple solution. By forgoing one of these approximations and partially modifying the hypothesis, a more exact solution is obtained. M.M.

A72-16600 **Oil slick remote sensing.** J. T. Smith, Jr. (NOAA, National Ocean Survey, Rockville, Md.). *Photogrammetric Engineering*, vol. 37, Dec. 1971, p. 1243-1248.

An oil spill off Cape Hatteras, North Carolina, resulting from the sinking of a tanker, was located and photographed by the National Ocean Survey using its Buffalo photographic aircraft equipped with two aerial cameras and a thermal-IR scanner. The spill was found about 80 nautical miles east-southeast from the reported position of the sinking of the stern section. Probable reasons explaining this phenomenon were examined. It was speculated that the bow of the ship had been carried by ocean currents to its eventual location where it sank and released its cargo of oil. O.H.

A72-22406 **Fabrication and irradiation behavior of uranium mononitride.** V. J. Tennery, T. N. Washburn, and J. L. Scott (Oak Ridge National Laboratory, Oak Ridge, Tenn.). In: *Ceramics in severe environments; Proceedings of the Sixth University Conference on Ceramic Science, North Carolina State University, Raleigh, N.C., December 7-9, 1970.* New York, Plenum Press, 1971, p. 587-599; Discussion, p. 599, 600. 9 refs. AEC-sponsored research.

Uranium mononitride is a candidate fuel for nuclear reactors for applications in space because of its high thermal conductivity, high fissile atom density, and dimensional stability at high temperature. High purity UN ceramics fabricated from nitride powders by uniaxial

or isostatic pressing and sintered in nitrogen at temperatures exceeding 2000 C, were irradiated at fuel temperatures to 1500 C and 2 wt % burnup. Results indicate no chemical reaction zone between fuel and metallic cladding, fuel swelling less than 2.8% per atomic per cent burnup, and maximum fission gas release of 7% of that generated. (Author)

A72-28879 # Future patterns of aircraft operations and fuel burnouts with remarks on contrail formation over the United States. W. B. Beckwith (United Air Lines, Inc., Chicago, Ill.). In: International Conference on Aerospace and Aeronautical Meteorology, 1st, Washington, D.C., May 22-26, 1972, Preprints. Boston, American Meteorological Society, 1972, p. 422-426. 12 refs.

An attempt is made to forecast turbine aircraft fuel burnouts to obtain data necessary for estimating the total effects of exhaust products on air quality. Altitude, seasonal, and latitudinal variations in fuel burnout are examined. The problem of contrail formation is discussed, and preliminary contrail observational findings are presented. O.H.

A72-29451 # Theoretical investigation of combustion-product parameters for a natural gas burning in oxygen (Teoreticheskie issledovaniia parametrov produktov sgoraniia pri szhigani prirodnogo gaza v kislorode). N. N. Popov and L. F. Ial'nitskii. *Samoletostroenie i Tekhnika Vozdushnogo Flota*, no. 26, 1971, p. 3-8. In Russian.

The principal thermodynamic parameters of the gas resulting from the combustion of natural gas in an oxygen atmosphere are calculated. The gas temperatures in the combustion chamber and at the nozzle exit section and the gas flow rates are plotted against the pressure (1.72 to 25 atm abs) and the excess oxidant ratio (0.5 to 3). It is shown that for each pressure there is an optimal excess oxidant ratio for which the combustion temperature is maximal. The thermodynamic parameters are compared with those obtained for a hydrocarbon fuel burning in oxygen. V.P.

A72-36162 # Simulations of the radioactive decay of Th/228/ used in the form of ThO₂ as a heat source for thermionic energy conversion. R. J. E. De Bruyne (Bekaert, S.A., Zwevegem, Belgium), M. J. Brabers (Leuven, Katholieke Universiteit, Louvain, Belgium), and F. Casteels (Studiecentrum voor Kernenergie, Mol, Belgium). *International Atomic Energy Agency and European Nuclear Energy Agency, International Conference on Thermionic Electrical Power Generation, 3rd, Jülich, West Germany, June 5-9, 1972, Paper*. 11 p.

It is shown that ThO₂, W and Pb are compatible for times in excess of 14 days at 1700 and 2000 C as materials for thermionic energy conversion. W can be effectively used as an oxygen getter in a ThO₂(228) heat source. A large amount of energy can be obtained in a relatively short time from a ThO₂(228) fueled thermionic converter, with a close to negligible vaporization of ThO₂ and Th(WO₄)₂. V.Z.

A72-36169 # State of development of an actinium fueled thermionic generator. H. Birnbreier, G. Gammel (Brown, Boveri et Cie. AG, Mannheim, West Germany), G. Dumont, M. Poskin (Union Minière, Brussels, Belgium), L. H. Baetsle, W. van Lierde (Centre d'Etude de l'Energie Nucléaire, Mol, Belgium). *International Atomic Energy Agency and European Nuclear Energy Agency, International Conference on Thermionic Electrical Power Generation, 3rd, Jülich, West Germany, June 5-9, 1972, Paper*. 14 p. Research sponsored by the Bundesministerium für Bildung und Wissenschaft.

A73-12955 # The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel (Zur Untersuchung der Einwirkung der akustischen Schwingungen auf den Verbrennungsvorgang des gasförmigen Brennstoffes). Iu. Ia. Borissov, E. I. Rosenfeld, and V. G. Smolenskii (Akademiia Nauk SSSR, Akusticheskii Institut, Moscow, USSR). In: International Congress on Acoustics, 7th, Budapest, Hungary, August 18-26, 1971, Proceed-

ings. Volume 1. Budapest, Akademiai Kiado, 1971, p. 249-252. 8 refs. In German.

Particular attention in the study was given to peculiarities regarding the propagation of the acoustic waves in the flame. In the investigations natural gas was burned in cylindrical chambers. The effect of the acoustic oscillations was determined on the basis of changes in carbon dioxide concentrations and temperature in the flame. It was found that the sound effects caused an enhancement of the turbulence in the combustion chamber. G.R.

A73-15867 # Pollutants from methane fueled gas turbine combustion. P. G. Parikh, R. F. Sawyer (California, University, Berkeley, Calif.), and A. L. London (Stanford University, Stanford, Calif.). *American Society of Mechanical Engineers, Winter Annual Meeting, New York, N.Y., Nov. 26-30, 1972, Paper 72-WA/GT-3*. 8 p. 14 refs. Members, \$1.00; nonmembers, \$3.00. U.S. Environmental Protection Agency Grant No. AP-385.

In view of the greater flexibility of a gas turbine combustion system design as compared to that for a piston engine, control of nitric oxide emissions even while keeping the CO and hydrocarbon emissions at very low levels appears feasible. Factors influencing the production of these pollutants in a methane fueled gas turbine type combustor are studied in this investigation by analyzing the gas samples taken at various locations within the combustor. Increasing the homogeneity of the primary zone gas composition by using gaseous or prevaporized liquid fuels is found to be an effective way to reduced nitric oxide emissions. (Author)

A73-16382 A theoretical study of geothermal energy extraction. F. H. Harlow and W. E. Pracht (California, University, Los Alamos, N. Mex.). *Journal of Geophysical Research*, vol. 77, Dec. 10, 1972, p. 7038-7048. 7 refs. AEC-sponsored research.

Efficient extraction of geothermal energy from a dry well depends on the ability to establish a closed pressurized circuit of water through a large zone fractured in hot impermeable rock. Long-term perpetuation of significant power extraction depends, in addition, on the ability to extend the initial fracture zone through the effects of thermal stress cracking of the adjacent hot rocks. In support of an experimental program to test the feasibility using this type of energy source, the combined equations describing the coupled processes of fluid flow, heat transport, and rock fracture were solved numerically. The results show a strong dependence on the extent to which underground pressure can be maintained and the fracture zone continuously extended. They indicate that under favorable, but perhaps not unreasonably exotic, circumstances the extraction of significant thermal power from each well can be expected to continue for many decades. (Author)

A73-16687 # Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films. J. T. Leonard and J. C. Burnett (U.S. Navy, Naval Research Laboratory, Washington, D.C.). *Combustion Institute, Fall Meeting, U.S. Naval Postgraduate School, Monterey, Calif., Oct. 30, 31, 1972, WSCI Paper 72-27*. 33 p. 23 refs.

A73-17192 Accurate localization by the Geole Project satellite (Localisation précise par satellite Projet Géole). D. Thieriet (Centre National d'Etudes Spatiales, Brétigny-sur-Orge, Essonne, France). *L'Aéronautique et l'Astronautique*, no. 37, 1972, p. 43-53. In French.

Review of some of the problems raised by space activities devoted to earth surface observations for various specific purposes, and description of the main features of the French geodetic Geole-Project satellite. Following a definition of the localization accuracy and speed requirements of oil-prospecting, geodetic, cartographic, topographic, and glaciological tasks, as well as of their respective occurrence frequency, the desirable features of geostationary and nongeostationary satellite systems for the performance of such tasks are considered, and the system selected for the Geole Project is described in terms of its underlying principle, orbit, chosen frequency bands and signals, antennas, and performance capabilities. M.V.E.

03 OTHER PRIMARY ENERGY SOURCES

A73-22819 Thermionic fuel element development status summary. J. W. Holland (Gulf General Atomic Co., San Diego, Calif.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. (A73-22751 09-03) Washington, D.C., American Chemical Society, 1972, p. 1060-1065. 8 refs.

Operating and environmental requirements of the thermionic fuel element (TFE) under development for the AEC is summarized in this paper for the various space applications of in-core thermionic reactor power plants. The approach and program milestones for TFE development are briefly reviewed followed by a description of the key technologies under study. Technology status is compared to the requirements of the various applications. (Author)

A73-23682 # Aircraft of the future (Flugzeuge der Zukunft). I. Tolztych. (*Grazhdanskaya Aviatsiya*, no. 6, 1972, p. 18, 19.) *Technisch-ökonomische Informationen der zivilen Luftfahrt*, vol. 8, no. 9, 1972, p. 419-424. In German. (Translation).

Evaluation of the technical and economic efficiency of types of aircraft likely to be developed in the coming decades. The problem of evaluating the degree of structural maturity and perfection of passenger aircraft and their economic efficiency is discussed. Problems connected with the development of increasingly high-speed subsonic aircraft, supersonic, and, ultimately, hypersonic aircraft are discussed, including engine designs, fuels, and noise reduction. In addition, the use of VSTOLs to provide more efficient transportation between airports and city centers is considered. A.B.K.

A73-25459 Advances in organic geochemistry 1971; Proceedings of the Fifth International Meeting, Hanover, West Germany, September 7-10, 1971. Meeting supported by the Bundesministerium für Bildung und Wissenschaft, Niedersächsische Landesregierung, et al. Edited by H. R. v. Gaertner and H. Wehner (Bundesanstalt für Bodenforschung, Hanover, West Germany). Oxford and New York, Pergamon Press (International Series of Monographs in Earth Sciences, Volume 33), 1972. 726 p. In English, French, and German. \$45.

Results of field and laboratory experiments dealing with the geochemistry of rocks, soils, water, and isotopes are described along with research on the geology of coal and petroleum. Topics examined include the characterization and classification of fossil organic substances dispersed in sediments, laboratory simulation of organic geochemical processes, genetic criteria for defining oil types in sedimentary basins and for relating the oils to their source rocks, the origin and significance of organic matter in various environments, and features of coal and oil deposits in different localities. Techniques of analysis and the methodology of geochemical research are described extensively. T.M.

A73-25465 * The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol. R. E. Cox, J. R. Maxwell (Bristol, University, Bristol, England), R. G. Ackman, and S. N. Hooper (Fisheries Research Board of Canada, Halifax, Nova Scotia, Canada). In: Advances in organic geochemistry 1971; Proceedings of the Fifth International Meeting, Hanover, West Germany, September 7-10, 1971. Oxford and New York, Pergamon Press, 1972, p. 263-276. 25 refs. Research supported by the Natural Environment Research Council; Grant No. NGL-05-003-003.

A73-25471 * Proposed stratigraphic controls on the composition of crude oils reservoirized in the Green River formation, Uinta Basin, Utah. W. E. Reed and W. Henderson (California, University, Berkeley, Calif.). In: Advances in organic geochemistry 1971; Proceedings of the Fifth International Meeting, Hanover, West Germany, September 7-10, 1971. Oxford and New York, Pergamon Press, 1972, p. 499-514; Discussion, p. 514, 515. 26 refs. Grant No. NGL-05-003-003.

A73-29734 * 17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR. B. Balogh, D. M. Wilson, P. Christiansen, and A. L. Burlingame (California, University, Berkeley, Calif.). *Nature*, vol. 242, Apr. 27, 1973, p. 603-605. 14 refs. NASA-supported research.

During an investigation of C-13 NMR shifts and the structural correspondence of pentacyclic triterpenes a C-13 NMR study was conducted on one of the most abundant components of the hexane soluble fraction of oil shale bitumen of the Green River formation. A rigorous proof was derived exclusively from C-13 NMR data for the structure of the important triterpenoid fossil molecule. It was established that the structure of the isolated triterpane was 17alpha(H) hopane. G.R.

A73-33185 # Rotary wing economics in a time of changing social values. J. A. McKenna (United Aircraft Corp., Sikorsky Aircraft Div., Stratford, Conn.). In: Anglo-American Aeronautical Conference, 13th, London, England, June 4-8, 1973, Proceedings. London, Royal Aeronautical Society, 1973. 9 p.

Review of some of the ecological advantages of using helicopters for carrying out logging operations, passenger transport, and offshore oil exploration and production. It is shown that rotary-wing aircraft have provided access to critical lumber resources without causing a harmful environmental impact on the forests. Another advantage of the helicopter is that its use for short-haul air transportation will save land that would otherwise be wasted on large airports. Finally, the economic advantage of using helicopters for offshore oil production and transportation (particularly in the North Sea) to avoid undue dependence on Middle East sources is stressed. A.B.K.

A73-33360 Quantitative thermal mapping problems. C. O. Thomas and F. M. Shofner (Environmental Systems Corp., Knoxville, Tenn.). In: Operational remote sensing; Proceedings of the Seminar, Houston, Tex., February 1-4, 1972. Falls Church, Va., American Society of Photogrammetry, 1972, p. 141-144; Discussion, p. 145.

Major attention is given toward thermal mapping applications at electrical power generating sites, i.e., the mapping of the thermal outfall from fossil or nuclear fuel plants. The material is stated from the viewpoint of the client, rather than the equipment manufacturer or survey firm. This is considered to be the application area with the greatest present need for quantitative thermal information, and the application with the greatest technical potential for airborne thermal mapping. Complete thermal analysis requires three-dimensional data. The data-tape route is believed to be superior to the direct record route for quantitative or even qualitative operations and, even with data tape methods, the eventual film imagery should not be viewed as the 'quantitative' record. F.R.L.

A73-36250 # The spread of oil in the Arctic. D. P. Hoult (MIT, Cambridge, Mass.). *American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, 6th, Palm Springs, Calif., July 16-18, 1973, Paper 73-701*. 9 p. 9 refs. Members, \$1.50; nonmembers, \$2.00.

The problem of oil spreading over Arctic ice is studied, the main topics considered being the rate of spread of oil released from a point on the surface, and the size attained by the area of the oil slick before it is caught in the pockets of the ice surface. The random character of the ice surface controls the final size of the oil slick and its rate of spread. It is found that, properly scaled, field data are in good agreement with both laboratory data and theory. These results serve to provide an understanding of the potential for oil pollution when oil is spilled in the high Arctic on either tundra or pack ice with no leads. F.R.L.

A73-38427 # Compatibility of the MHW-RTG heat source materials. D. Pavone (California, University, Los Alamos, N. Mex.), J. D. Watrous (Donald W. Douglas Laboratories, Richland, Wash.), and P. E. Brown (General Electric Co., Philadelphia, Pa.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa.,

August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 89-112. 14 refs. Contracts No. AT(29-2)-2831; No. AT(45-1)-2138; No. W-7405-eng-36.

The maximum operational temperatures which the multi-hundred watt radioisotope thermoelectric generator heat source must maintain and the possible thermochemical environments to which it may be subjected by accident, impose special requirements for compatibility among the heat source materials. The radioisotope fuel, Pu-238 is used in the form of the dioxide; the primary containment material is a shell of elemental iridium. An impact shell of carbon in the form of graphitized, impregnated fibers protects the primary containment from rupture in the case of accidental impact. The compatibility of these materials among themselves has been demonstrated by a series of tests at both operational and reentry temperatures. The test conditions imposed and the test results observed are reported. The data supporting the selection of the PuO₂ + Ir + C materials system, in preference to other candidates are presented. (Author)

A73-38429 # Design of a curium-244 heat source for the multi-hundred watt generator. R. D. Casagrande and J. A. Garate (General Electric Co., Philadelphia, Pa.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 117-128. 13 refs. Contract No. AT(29-2)-2831.

A preliminary design concept of a 3200-W curium-244 heat source sized for the multi-hundred watt radioisotope thermoelectric generator (MHW-RTG) is presented. The RTG utilizes 312 SiGe thermocouples, operates at a hot junction temperature of about 1000 C, and is designed to produce 193 W(e) at beginning of life and 125 W(e) after five years. The expected low cost and high power density of the curium-244 results in very desirable reductions in system cost and weight when compared to equivalent Pu-238 fueled systems. The curium RTG specific cost is estimated to be about \$4900/watt and will deliver 2.9 watts/lb at beginning of life. This compares with a plutonium RTG specific cost of \$16,000/watt and a specific weight of 1.8 watts/lb at beginning of life. (Author)

A73-38430 # The availability and cost of curium-244 from power reactor fuel reprocessing wastes. P. E. Brown (General Electric Co., Philadelphia, Pa.), E. Lamb (Oak Ridge National Laboratory, Oak Ridge, Tenn.), and D. G. Albertson (General Electric Co., Nuclear Energy Div., San Jose, Calif.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 129-142. 43 refs. Contract No. AT(29-2)-2831.

The operation of a nuclear/electric power generating station will yield curium-244 as the product of six successive neutron captures in the uranium-238 which is the preponderant constituent of the nuclear reactor fuel. Projections of curium availability from the wastes generated in the reprocessing of typical light water reactor fuel cores are given. The sensitivity of curium production to the level of fuel burn-up and the effect on the quantity of curium produced, if plutonium-enriched uranium fuels are used, is discussed. Based on the projected availability and the possible chemical flow sheets, probable costs for the recovery of raw Cm-244 are developed. (Author)

A73-39895 # Thermal activity of the Uson Caldera based on infrared and photographic aerial survey. B. V. Shilin, N. A. Gusev, E. I. Vavilov, and E. Ia. Karizhenskii (Ministry of Geology, Laboratory for Aeromethods, Leningrad, USSR). In: International Symposium on Remote Sensing of Environment, 8th, Ann Arbor, Mich., October 2-6, 1972, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1973, p. 1147-1157. 7 refs.

Currently, the study of thermally active geological regions has important significance not only from the aspect of studying the mechanisms of geothermal distribution processes, but also from the viewpoint of locating areas containing an important energy source - hot water. A method which enables one to quickly map large areas for the purpose of finding anomalous temperature regions is the recently developed infrared or thermal mapper. These mappers are sensitive to the thermal radiation emitted by the terrain in the 1.8 to 5.3 micron spectral intervals. Modern airborne IR equipment can detect temperature differences of the terrain with a high degree of sensitivity (tenths of a degree Celsius) which enables one to obtain an image of the terrain that approaches the quality obtainable by photographic means. The use of airborne IR mappers in surveying the thermally active volcanic regions of the Kamchatka peninsula is discussed and results of the survey are presented. (Author)

A73-39896 # Geological analysis of aerial thermography of the Canary Islands, Spain. R. S. Williams, Jr. (U.S. Geological Survey, Washington, D.C.) and D. Fernandopullé (UNESCO, Las Palmas, Canary Islands, Spain). In: International Symposium on Remote Sensing of Environment, 8th, Ann Arbor, Mich., October 2-6, 1972, Proceedings. Volume 2. Ann Arbor, Mich., Environmental Research Institute of Michigan, 1973, p. 1159-1194. 18 refs.

In May 1971, the seven main islands of the Canary Islands volcanic archipelago were surveyed with an airborne thermal infrared scanning radiometer. The survey objective was to locate, by thermal differences, any zones of ground water discharge (submarine springs) into the ocean. In addition, the geothermal area on Lanzarote, Montañas del Fuego de Timanfaya, and interior areas of other islands were surveyed. The seven principal islands and numerous islets of the Canary Islands group are volcanic in origin and trend in a northeast-southwest direction about 100 kilometers offshore from the Spanish Sahara. The islands are composed of several thick volcanic formations varying from basalts, trachytes, phonolites, ignimbrites to conglomeratic beds. (Author)

A73-40766 Fuel capsule vent system development for the Viking radioisotope thermoelectric generator. F. A. Schumann (Teledyne Co., Isotopes Energy Systems Div., Timonium, Md.). *Nuclear Technology*, vol. 19, Sept. 1973, p. 156-164. Contract No. AT(29-2)-2960.

A fuel capsule vent system was developed and designed for the radioisotope thermoelectric generator (RTG) in support of the upcoming Viking mission to Mars. Helium is continuously produced within the fuel capsule as a result of isotopic decay. By venting the helium external to the RTG, the initial RTG fill gas is maintained for maximum thermal efficiency. This reduces degradation of thermoelectric converter performance and provides the maximum electrical power for the mission. (Author)

A73-41172 # Arctic resources airplane transportation system. M. T. Friedl. *RAeS, AIAA, and CASI, Anglo-American Aeronautical Conference, 13th, London, England, June 4-8, 1973, Paper. 25 p.*

A transportation system specifically designed to move natural resources, primarily crude oil or liquid natural gas (LNG) out of the arctic by air is discussed. A typical gross weight for the aircraft is 3,500,000 lb, carrying a payload of over 2,000,000 lb at a relatively low Mach number at altitudes up to 40,000 ft. As a liquid natural gas transporter, 35 aircraft of this size in operation at 1800 n mi range are equivalent in capacity to a 48-in. gas pipeline. The importance of design for low cost is emphasized, and various configurations are evaluated. Attention is given to aspects of cargo handling and terminals. F.R.L.

03 OTHER PRIMARY ENERGY SOURCES

N68-10240# Aeronautical Chart and Information Center, St. Louis, Mo. Linguistic Section.

DATA OF GRAVIMETRIC SURVEYS AND PROBLEMS OF DIRECT SEARCH FOR OIL AND GAS ON THE MONZHUKLY STRUCTURE [REZULTATY GRAVIMETRICHESKIKH ISSLEDOVANIY S ZADACHEY PRYAMYKH POISKOV NEFTI I GAZA NA STRUKTURE MONZHUKLY]

B. I. Kireyev Jul. 1967 6 p refs Transl. into ENGLISH from Razved. Geofys. (Moscow), no. 8, 1965 p 104-108 (ACIC-TC-1217; TT-67-62630; AD-656991)

Gravimetric measurements along three profiles were taken on the Monzhukly structure. A weak gravity minimum was noted in the crest part of the Monzhukly fold. I. G. Modovskiy hypothetically explained its nature by the presence of screened gas and oil deposits in the northern part of the block of the fold. A detailed gravimetric survey was conducted for the determination of this minimum. This detailed survey made it possible to outline more precisely the general relative gravity maximum, corresponding to the structure, and to separate against its background a relative gravitational minimum. A comparison between the data of the gravimetric survey and the geological map distinctly shows the confinement of the minimum to the northern block of the fold. In the Monzhukly region, the given minimum could be caused by the influence of the terrain relief not being sufficiently taken into account, by errors in the determination of the Bouguer correction, by the presence of oil and gas deposits in the interior part of the fold, by the lithologic-structural characteristic of the fold. The paper discusses the above possibilities and explanations, with the conclusions drawn from the gravimetric and geologic studies.

Author (TAB)

N68-10414 Technische Hogeschool, Eindhoven (Netherlands).
ON THE MECHANISM OF THE GENERATION OF PETROLEUM

Jan Willem Jurg (Ph.D. Thesis) 26 Sep. 1967 56 p refs

Current thinking on the origin and generation of crude oil is reviewed, including the generation of hydrocarbons from a straight chain fatty acid. Experiments were conducted to determine if the water in sediments was a significant factor in petroleum generation, and behenic acid and clay were mixed with enough water to insure its presence as a liquid at the temperature of heating. At temperatures around 250°C, hydrocarbons and fatty acids were generated from the behenic acid-clay mixture, although less hydrocarbon resulted in experiments with water than without. It is concluded that because isomerization is strong in the experiments without water, carbonium ions act as intermediates in the generation of low molecular weight hydrocarbons; while the water experiments with less isomerization produce radicals as intermediates. In both the water and waterless experiments, radicals were the intermediates in the formation of long chain n-alkanes and fatty acids; and a mechanism is suggested for the generation of homologous series of these long chains from an even-numbered fatty acid.

M.W.R.

N68-10864 Commissariat a l'Energie Atomique, Saclay (France).
DESIGN OF A PILOT CELL FOR STRONTIUM-90 EXTRACTION BY SOLVENT [PROJET DE CELLULE PILOTE D'EXTRACTION PAR SOLVANT DU STRONTIUM 90]

J. Fradin Brussels EURATOM Sep. 1967 108 p In FRENCH; ENGLISH summary (Contract EURATOM-025-62-10- RISF) (EUR-3613.f)

The design of this plant was undertaken with the object of constructing a pilot apparatus for the study of the separation of the elements contained in fission products. The plant should yield technological information as well as data on the process (efficiency, Kd value, etc.). It is also felt that this plant might serve as a basis for the design of a unit for the production of strontium-90

and rare earths for treating effluent solutions from an irradiated fuel reprocessing plant. The report includes a description of the process and an examination of the safety precautions, the equipment, and the controls, measurements and monitoring and regulating devices.

Author

N68-11281# Atomics International, Canoga Park, Calif.
HEAVY WATER ORGANIC COOLED REACTOR. THE PREPARATION OF URANIUM CARBIDE FROM ECONOMICAL URANIUM COMPOUNDS

L. A. Hanson 15 Aug. 1967 34 p refs Prepared jointly with Combustion Engineering, Inc.

(Contract AT(38-1)-430)

(AI-CE-73) CFSTI: HC\$3.00/MF\$0.65

The preparation of uranium carbide (UC) from uranium tetrafluoride, ammonium diuranate (ADU), and uranium trioxide (UO₃) was studied on a gram scale to establish basic process parameters for economic comparison with the conventional UO₂ to UC fabrication method. The process developed in each case involved compacting blended powders (which were, respectively, UF₄-SiO₂-C, (NH₄)₂U₂O₇-SiO₂-C, and UO₃-C) and heating in vacuum in stages to convert the uranium compound to UO₂ at temperatures up to 850°C and carbothermally reduce the resulting UO₂ to UC at temperatures above 1300°C. The SiO₂ was used in the ADU conversion to remove a fluorine contaminant without uranium loss. Uranium carbide of controlled carbon content and low oxygen content was produced from each of these compounds. Uranium carbide was prepared from ADU in 20-kg quantities to demonstrate production scale-up of one of the processes studied. The UC produced was of equivalent or better quality than that produced from UO₂ under similar conditions. An economic comparison indicated that there are potential savings in using each of these materials, depending on the uranium source, instead of UO₂ for UC production. Quantitative evaluation of experimental results and overall economics indicates that only marginal savings may be gained by using ADU and UO₃; but a cost reduction is expected using UF₄.

Author (NSA)

N68-12420# Oak Ridge National Lab., Tenn.
A SURVEY OF EQUILIBRIUM FUEL-CYCLE COSTS FOR A LOW-ENRICHED, UNCLAD, HELIUM-COOLED UO₂ GRAPHITE REACTOR

C. M. Podeweltz Jun. 1967 55 p refs

(Contract W-7405-ENG-26)

(ORNL-TM-1789)

A survey of equilibrium, fuel-cycle costs associated with various combinations of lattice pitch, enrichment and fuel-hole size has been carried out for a gas-cooled, unclad, UO₂-graphite reactor. The UO₂ was assumed to be formed into pellets with no coating applied. Nineteen UO₂ holes intermingled with 42 coolant channels comprised a central cluster region in the graphite cell. Enrichment was varied in the range of natural to 5%; lattice pitch in the range of 10.8 to 14.8 in. Two fuel-hole dia. 0.375 and 0.576 in., were investigated. The reactor was assumed to deliver 1900 MW(t) and 760 MW(e). Multigroup, point-depletion calculations of the homogenized cell were performed utilizing GAM self-shielded, resonance cross sections and flux-weighted THERMOS cross sections. For the set of small fuel-hole reactors a minimum fuel-cycle cost of 1.314 mills/kWhr(e) was found. The reactor for which this cost obtained had a conversion ratio of 0.551, and a burnup of 41,083 MWd/t. For the large fuel-hole set the corresponding values were 1.160, 0.637, and 29,400

Author (NSA)

N68-12553# Oak Ridge National Lab., Tenn.
COMPARATIVE EVALUATION OF SOL-GEL FUEL FABRICATION COSTS

T. N. Washburn, A. L. Lotts, and F. E. Harrington Sep. 1967 55 p refs Presented at the CNEN Symp., Turin, 2-3 Oct. 1967

(Contract W-7405-ENG-26)

(ORNL-TM-1979; CONF-671008-2) CFSTI: HC\$3.00/MF\$0.65

Estimates were made of the costs of fuel preparation and fabrication of sol-gel metal-clad (U,Pu)O₂ fuel elements. Four processes were compared, and their costs, including hardware, were: low-energy packing of microspheres, \$331/kg; vibratory compaction, \$337/kg; pelletizing, \$342/kg; and sol-gel extrusion, \$331/kg for 0.220-in.-dia UO₂-18% PuO₂. These costs include only the plant operating expenses and capital charges at a fixed annual rate of 22%. The hypothetical plant produces 500 kg of core fuel per day to support a fast reactor industry of 15,000 MW(e). Costs of fuel material, fuel losses, inventory, and scrap recovery were not included, since they are the same for all the processes. Projected technology indicates little economic difference among the four processes, and each could be an excellent contender for production of fast reactor fuel. Continued development is needed to define more adequately the technical and economic capabilities and limitations of the four methods. Author (NSA)

N68-12884# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CRITICAL EXPERIMENTS WITH ORGANIC MODERATORS—MONOISOPROPYL DIPHENYL AND GAS OIL [KRITICHESKIYE OPYTY S ORGANICHESKIMI YAMEDLITELYAMI-MONOIZOPROPILDIFENILOM I GAZOYLEM]

Yu. N. Aleksenko, V. I. Buynitskaya, V. V. Zaslavskiy, N. V. Zvonov, and V. N. Kozlov 3 May 1967 15 p. Transl. into ENGLISH from Issled. po Primeneniyu Organ. Teplonositeley Zamedlitley v Energ. Reaktorakh (USSR), 1964 p 182-193 (Contract AF 33(657)-16410)

(FTD-HT-66-746; TT-67-63251; AD-660438)

The article presents the results of critical tests on the organic moderators isopropylbiphenyl and gas oil, a description of an experimental "organic reactor," and some results of measurements carried out on this reactor. Graphs are included showing the distribution of thermal neutrons for different values of lattice spacing, the calculated dependence of the effective addition for gas oil and monoisopropylbiphenyl, the dependence of the critical number of channels for monoisopropylbiphenyl on the lattice spacing and for gas oil on both the temperature and lattice spacing, as well as the calculated values of the square length of moderation for biphenyl, monoisopropylbiphenyl, and gas oil. It is concluded that the physical experiments with critical assemblies carried out on monoisopropylbiphenyl and gas oil have made it possible to verify the method and system of constants used for calculating the physical characteristics of reactors with organic heat-transfer agents.

Author (TAB)

N68-15630# Naval Scientific Technical Information Center, London (England).

THE DETERMINATION OF SULPHUR IN PETROLEUM PRODUCTS

K. Krumbholz and G. Jaeckel Aug. 1967 9 p. refs. Transl. into ENGLISH from Chem. Tech. (Berlin), v. 17, no. 10, Oct. 1965 p 619-620

(NSTIC/13106/67; NSTIC-TRANS-1848; AD-662486)

In the fuel industry, the most usual method for the determination of total sulphur in petroleum is the oxidation principle by combustion of the sample in a stream of oxygen or air, followed by determination of the sulphur as sulphate. The extensive field of usefulness and the efficiency of the hydration method of sulphur determination are given. All industrial petroleum products, including low-temperature lignite tar, can be analysed by the hydration method. Besides these good results of sulphur determination by the hydration method, the consequent improvement in productivity compared with the method of oxyhydrogen gas deserves special mention, the improvement being as much as 500%. This is attained by working with minimal sample quantities and the elimination of the tedious preparation of the absorption solution for the analysis of the sulphate.

Author (TAB)

N68-16844# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

INSTRUMENT FOR STUDYING THE OXIDIZABILITY OF PETROLEUM HYDROCARBONS AT HIGH TEMPERATURES

G. F. Bol'shakov 23 Oct. 1967 8 p. refs. Transl. into ENGLISH from Vyssh. Ucheb. Zaved., Izv. i Gaz, no. 9, 1964 p 61-63 (Contract NOW-62-0604-c)

(ITG-230-T533; AD-663076)

A method for determining the oxidizability of fuels and lubricants by measuring the absorption of oxygen at high temperatures is described. The instrument used enables readings to be taken at constant pressure, thus avoiding errors due to fluctuations in atmospheric pressure.

Author (TAB)

N68-17192# Comision Nacional de Energia Atomica, Buenos Aires (Argentina).

DETERMINATION OF URANIUM WITH A POTENTIAL-CONTROLLED COULOMETRIC TITRATOR [DETERMINACION DE URANIO CON UN TITULADOR CULOMBIMETRICO A POTENCIAL CONTROLADO]

Walter J. Krause and G. A. Dupetit 1967 25 p. refs. In SPANISH; ENGLISH summary (CNEA-192)

The determination of uranium in the 2 to 20 mg per sample range with a potential-controlled coulometric titrator has been studied for the subsequent determination and control of the uranium concentration in solutions arising from the various phases in the irradiated fuel reprocessing plant. Therefore, the method is available in presence of aluminum and nitric in relatively large amounts and permits small quantities of Fe(III) and Hg(II). The determination is based on the U(VI)-U(IV) reduction in a potential-controlled mercury cathode cell, using 1M sulphuric acid as supporting electrolyte. The reduction mean time oscillates between 12 and 18 minutes and the obtained results agree within a standard deviation of 0.1 to 0.8%. A general outline about the electrical calibration of the titrator is given too, using furthermore an iron standard solution and a platinum electrode cell.

Author

N68-17316*# California Univ., Berkeley, Lawrence Radiation Lab. **TREATISE IN ORGANIC GEOCHEMISTRY**

Eugene Desmond McCarthy (Ph.D. Thesis) Aug. 1967 290 p. refs

(Grant NSG-101-61; Contract W-7405-ENG-48)

(NASA-CR-93111; UCRL-17758) CFSTI: HC \$3.00/MF \$0.65 CSCL 08D

Major problems in organic geochemistry and their relation to the more fundamental scientific questions of chemical evolution and the origin of life were studied. In the experimental approach adopted in this treatise, almost all of the analytical techniques of modern organic chemistry have been utilised in the structural identification of the organic components isolated from a series of crude oils and sediments. Since the major part of the work has concentrated on the hydrocarbons, there has been a particular emphasis on capillary gas chromatography and mass spectrometry. The recent introduction of a combined gas chromatograph-mass spectrometer suggests that this instrument will be the most powerful analytical technique available to organic geochemists.

Author

N68-17606 Joint Publications Research Service, Washington, D. C.

EXPLORATORY GEOPHYSICS IN THE USSR DURING THE YEARS OF SOVIET RULE (1917-1967)

V. V. Fedynskiy In its Soviet-Bloc Res. in Geophys., Astron., and Space, No. 174 19 Feb. 1968 p 140-172 Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Fiz. Zemli (Moscow), no. 11, Nov. 1967 p 90-112

The history of the development of exploratory geology is described, emphasizing applications to the national economy. Stress

03 OTHER PRIMARY ENERGY SOURCES

is placed on the use of seismology in the petroleum industry, and prospecting for minerals is described. Improvements in making geophysical instruments are mentioned, and the most important tasks to be undertaken in the near future are identified. N.E.N.

N68-17607 Joint Publications Research Service, Washington, D. C.

DEVELOPMENT OF SEISMIC PROSPECTING METHODS IN THE USSR

N. N. Puzrev. *In its Soviet-Bloc. Res. in Geophys., Astron., and Space*, No. 174 19 Feb. 1968 p 173-185 Transl. into ENGLISH from *Izv. Akad. Nauk SSSR, Fiz. Zemli* (Moscow), no. 11, Nov. 1967 p 113-121

A brief history of the use of dynamic wave characteristics for prospecting purposes is presented. The refracted and reflected wave methods are identified as the most important, and development of increasingly sensitive instruments for signal measurement is mentioned. Locating petroleum fields is emphasized, and mineral prospecting is covered. The development of dynamic theories of wave propagation through different geological media is outlined, and the use of seismic waves in investigations of structural geology is described. N.E.N.

N68-19175# Shell Research, Ltd., Chester (England). Thornton Research Center.

INVESTIGATION OF THE PECULIARITIES OF PRE-FLAME PROCESSES AND IGNITION OF HYDROCARBONS OF VARIOUS STRUCTURES. PART 1: VARIATION OF COOL FLAME DELAY AND IGNITION DELAY WITH COMPRESSION TEMPERATURE AND PRESSURE

A. N. Voinov and D. I. Skorodelov [1967] 17 p refs Transl. into ENGLISH from *Kinetika i Kataliz* (USSR), v. 8, no. 2, 1967 p 252-260 *Its Transl. No. 1137*
CFSTI: HC\$3.00/MF\$0.65

The effect of compression temperature and pressure on the ignition delay and cool flame delay of hydrocarbons of different structures (n-hexane, hexene-1, cyclohexane, cyclohexene, isooctane diisobutylene and a mixture of 60% isooctane with 40% n-heptane) in stoichiometric proportions with air, was investigated. Sharp differences in the nature of the preflame processes are demonstrated—as a function of the ignition delay—between saturated and unsaturated as well as between cyclic and acyclic hydrocarbons. Good agreement is shown between the variation of ignition delay with temperature for hydrocarbons of different structures and the peculiarities of their behaviour in engines, in particular the effect of temperature on the detonation tendency. Author

N68-19265# Rocket Flats Div., Dow Chemical Co., Golden, Colo. STATIC BED REACTOR FOR STUDIES OF A PLUTONIUM HEXAFLUORIDE VOLATILITY PROCESS

Jerry D. Moseley and Herbert N. Robinson 5 Dec. 1967 19 p
(Contract AT(29-1)-1106)
(RFP-1048) CFSTI: HC\$3.00/MF\$0.65

Studies were begun to find if chemical separation and purification of plutonium from waste material could be achieved with fluoride volatility processes. Equipment designed for the project and for the procedures developed for use are described. Author (NSA)

N68-19925* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

REACTIVITY EFFECTS CAUSED BY RADIAL POWER FLATTENING IN A SMALL, FAST-SPECTRUM REACTOR

C. L. Whitmarsh, Jr. Washington Apr. 1968 13 p refs
(NASA-TN-D-4459) CFSTI: HC\$3.00/MF\$0.65 CSCL 181

The effect on criticality of flattening the radial power distribution in a small, reflector-controlled, fully enriched, fast-spectrum nuclear reactor was calculated. Compared to a

uniformly fueled, fully enriched core, a decrease in reactivity occurred from reduced fuel inventory and an increase in reactivity occurred from enhanced reflector worth. Fuel distributions were also calculated to indicate the effects of (1) changing the power ratio of 1.1, and (2) changing the reflector thickness to 7.62 cm. Change (1) resulted in a zoned core with an enrichment variation from 71.3 percent in the central zone to 93.2 percent in the peripheral zone; whereas, for change (2) these values were 67 and 93.2 percent, respectively. The net reactivity loss (fuel loss-reflector worth increase) based on a 93.2 percent enriched uniformly-fueled core was 3 percent for either of these zoned cores. Power distortion in a reactor core is caused by reflector movement required to compensate for reactivity changes over the core lifetime. This effect in zoned cores was observed by calculating power shapes for the initial and the end-of-life reflector configurations for two zoned cores. Author

N68-21041# General Electric Co., Philadelphia, Pa. APPLICATION OF RADIOISOTOPES FOR AEROSPACE WASTE RECLAMATION AND WATER SYSTEMS

Courtney A. Metzger (AMRL), Albert B. Herald (AMRL), Bobby J. Reynolds (AMRL), Rufus Shivers (AEC), and Robert W. Murray Wright-Patterson AFB, Ohio AMRL Sep. 1967 17 p Proc. given at the 2d Intern. Symp. on Nucleonics, Columbus, Ohio, 12-14 Jul. 1967

(Contract AF 33(615)-3308)

(AMRL-TR-67-158; AD-665457)

A life support system designed for aerospace application was thermally powered by a radioisotope heat source at a significant saving in electrical energy. This report summarizes the research program and resulting design, development, and evaluation of a vacuum distillation-vapor pyrolysis water reclamation system that was subjected to a 30-day isotope powered unmanned test. In addition to the savings of electrical energy the application of a radioisotope heat source is expected to result in a simple and more reliable water recovery system producing an excellent quality water without the use of pre- or post treatment for extended periods of operation. Discussed are other water recovery processes that show good promise for the utilization of isotopes for the thermal energy that have been subjected to comparison evaluation using electrical energy. The use of several waste management techniques to obtain a complex integrated system are discussed including urine and fecal collection, fecal storage, potable hot and cold water storage and dispensing, and potability measurements that show promise for the use of the waste heat from the isotopes. TAB

N68-21048# Stanford Univ., Calif.

DISTRIBUTION OF HYDROCARBON FLUIDS AND THEIR COMPOSITIONS IN VOLATILE OIL RESERVOIRS DURING DEPLETION

James Grover Taylor, (Ph.D. Thesis) 1966 117 p
Available from Univ. Microfilms: HC \$5.80/MF \$3.00 Order No. 67-4439

Described is a technique for mathematically simulating the solution-gas drive performance of a volatile oil reservoir on a digital computer. In the mathematical model, it is assumed that the phase behavior of the reservoir fluids may be approximated by a ternary hydrocarbon system and that the reservoir fluids are always in a state of thermodynamic equilibrium. The relationships between the overall concentration of the individual hydrocarbon components and the characteristics of the gas-oil relative permeability curves are shown quantitatively. Approximately ten minutes of computer time (Burroughs 5500) per run are required for the constant production-rate calculations reported. The reservoir studied was a linear system but extension to a radial system is outlined. The analysis developed may also be extended to hydrocarbon systems with more than three components. Dissert. Abstr.

N68-22608# Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Angewandte Reaktorphysik.

SUPPLEMENTARY MATERIAL TO THE REPORT NUCLEAR FUEL REQUIREMENTS AND COSTS OF VARIOUS REACTOR TYPES IN GERMANY, KFK 366 [ERGÄNZENDES MATERIAL ZUM BERICHT KERNBRENNSTOFFBEDARF UND KOSTEN VERSCHIEDENER REAKTORTYPEN IN DEUTSCHLAND, KFK 366]

H. Gruemm, D. Gupta, W. Haefele, P. Jansen, M. Recker et al Sep. 1966 246 p refs Transl. into ENGLISH from Rept. KFK-466

(KFK-466; AEC-TR-6859) CFSTI: HC\$3.00/MF\$0.65

The background material used in the preparation of the report KFK-366 is presented. A detailed representation is given of the analytical and numerical calculation methods. The projects discussed are nuclear fuel reserves and price development, nuclear energy reserves and the economy of nuclear power plants, mathematical model transformation of nuclear fuel elements in combined reactor systems, cost calculation, fuel cycle for reactors, estimation of future energy needs, and characteristic reactor data.

NSA

N68-23663# Ente Nazionale per l'Energia Elettrica (ENEL), Rome (Italy).

PROGRAM FOR USE OF PLUTONIUM IN THERMAL REACTORS [PROGRAMMA PER L'UTILIZZAZIONE DEL PLUTONIO NEI REATTORI TERMICI]

Brussels EURATOM Mar. 1968 52 p In ITALIAN; ENGLISH summary

(Contract EURATOM-092-66-6 TEEI)

(EUR-3890.1) CFSTI: HC\$3.00/MF\$0.65

The uranium fuel cycles for the two power plants were calculated, establishing the frequency and magnitude of reloads and the movements of fuel, and then the equivalent plutonium cycles were calculated. Taking the reference case for both plants to be the fuel cost calculated with an annual interest rate of 7.5% and a manufacturing price supplement of \$20/kg. the industrial value of the fissionable plutonium was worked out. The preliminary calculations to evaluate the number of prototype plutonium elements needed to reach a critical minimum showed that the eight elements now being fabricated are amply sufficient for these experiments. The nuclear characteristics of these elements were studied. The elements will have three different fissionable Pu enrichments: 2.85%, 1.40% and 0.74%. A study was conducted to compare the dynamic behavior of the plants with cores loaded with uranium and plutonium respectively.

Author

N68-23895# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

TANKAGE SYSTEMS FOR A METHANE-FUELED SUPERSONIC TRANSPORT

Joseph D. Eisenberg and Rene E. Chambellan Washington May 1968 21 p refs

(NASA-TM-X-1591) CFSTI: HC\$3.00/MF\$0.65 CSCL 01C

The use of liquid-methane fuel promises economic improvement, but its cryogenic nature causes on-board storage problems. Should the fuel be loaded in a saturated condition, much fuel will flash off due to pressure reductions during climb. Pressurized tanks or subcooled fuel will solve this problem. Subcooled fuels require a pressurizing gas. Low solubility gases have low availability and must be salvaged. Bladders or stand-pipes to reduce the contact area may be used with soluble or condensable pressurizers. Analytical studies indicate that these methods, when used separately or in combination, offer potential solutions to the tankage problem.

Author

N68-24990# Rugby Coll. of Engineering Tech. (England).

A COLLECTION OF NOTES ON DIESEL ENGINE ECONOMICS

P. J. Lawrence 1967 105 p refs

(Rept.-1) CFSTI: HC\$3.00/MF\$0.65

Design and developments of 4 stroke Diesel engines over the past fifteen years are surveyed for some twenty engines in the speed range 800 to 1800 rev. per minute with emphasis on engine size. Graphs depict the trend in piston speed and engine outputs in terms of H.P./in. ² of piston area as a function of mean effective pressure. An effort is made to predict possible effects of thermal ratings on engine costs and weight. Also covered is residual fuel burning in its context of economic importance for electricity generation and marine propulsion.

G.G.

N68-25283# Avco Corp., Lowell, Mass. Space Systems Div.

ISOTOPE REENTRY VEHICLE DESIGN STUDY: CONCEPTUAL DESIGN, PHASE 1A TOPICAL REPORT

May 1968 528 p refs

(Contract NAS3-10938)

(NASA-CR-72366; AVSSD-0071-68-CR) CFSTI: HC \$3.00/MF \$0.65 CSCL 18N

Document summarizes the Phase 1A conceptual design effort on the Isotope Reentry Vehicle (IRV) study. The major objective of the study is to develop a preliminary design of a 25 KW_t Pu 238 IRV. Major design emphasis is on system safety and developability. The IRV is configured to meet minimum practical diameter and weight limits. During Phase 1A various IRV, heat source, and heat-source heat exchanger concept combinations have been developed and evaluated. Three IRV systems have been recommended for detailed conceptual design evaluation in Phase 1B.

Author

N68-25716# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

PROBLEMS OF INCREASING THE RELIABILITY OF AUTOMATIC MINING EQUIPMENT

L. G. Mel'kumov and V. B. Ginzburg Redstone Arsenal, Ala. Redstone Sci. Inform. Center 19 Apr. 1968 17 p Transl. into ENGLISH from Mekhaniz. i Avtomatiz. Proizv. (Moscow), no. 7, 1966 p 50-52 Prepared by Army Missile Command

(NASA-TM-X-61123; RSIC-786) CFSTI: HC \$3.00/MF \$0.65 CSCL 131

Discussed are problems of reliability of automation equipment in coal mines. Special emphasis is placed on the actual operating reliability of the equipment, the nature of possible breakdown, and recommendations for improving reliability.

Author

N68-28954# Oak Ridge National Lab., Tenn.

TREND IN ATOMIC POWER GENERATION AND URANIUM RESOURCES

Teiji Kamiyama [1967] 14 p Transl. into ENGLISH from Genshiryoku Kogyo (Tokyo), v. 13, no. 2, 1967 p 5-8

(ORNL-TR-1825) CFSTI: HC\$3.00/MF\$0.65

Evaluation of the present trend in atomic power development and uranium supply is presented. Analysis of natural uranium resources in the free world is presented and requirements to 1985 are listed. Economics of ore processing and recovery for predicted requirements and uranium supply are described.

Author (NSA)

N68-29161# General Dynamics Corp., San Diego, Calif. General Atomic Div.

PROGRESS IN OPTIMIZING THE GAS-COOLED FAST BREEDER REACTOR

Raymond T. Shanstrom 29 Jun. 1967 19 p Presented at the Ann. Meeting of the Am. Soc. of Mech. Engr., Pittsburgh, Nov. 1967

(Contract AT(04-3)-167)

(GA-8032; CONF-671101-5) CFSTI: HC \$3.00/MF \$0.65

Fuel-cycle cost results are presented for variations in the design of a 1000 MW(e) gas cooled fast breeder reactor. Principal performance characteristics of the reference design are compared with values for both gas cooled and water cooled thermal reactors. Fuel cycle cost sensitivity to variations in the gas cooled fast breeder

03 OTHER PRIMARY ENERGY SOURCES

parameters is discussed, and indications for future improvement in the design are examined. NSA

N69-30262# Atomic Energy Commission, Washington, D. C.
RADIOISOTOPES: PRODUCTION AND DEVELOPMENT OF LARGE-SCALE USES

May 1968 45 p *Its* Wash No. 1095
CFSTI: HC\$3.00/MF\$0.65

Systems using radioactive isotopes as sources of heat and radiation are described. Its applications to spacecraft power and propulsion, terrestrial electric power generation, and chemical processing and production are reported. Special emphasis is placed on radioisotope batteries and other SNAP power generators.

Author

N68-33991# Atomic Energy Commission Research Establishment, Risö (Denmark). Reactor Physics Dept.

DESCRIPTION OF THE URU-PROGRAMME

P. L. Olgaard Jan. 1968 49 p refs

(RISO-M-684) CFSTI: HC\$3.00/MF\$0.65

The URU-program (Utilization in Reactors of Uranium) was prepared to allow an assessment of the natural uranium consumption of different types of uranium fuelled thermal reactors, i.e. non-breeders. In the first part of the program the number of MW_ed, the Pu-production and the amount of remaining U, all per t nat. U, are calculated. In the second part the integrated uranium consumption and plutonium production are calculated as functions of time for a system of reactors of a given type and with specified total capacity and power production. The cases of no recycling, of uranium cycling only and of plutonium and uranium recycling are considered. The report contains a derivation of the formulas used, instructions for the use of the programme, a print-out of the program, and a test example.

Author

N69-11048# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

SOL-GEL RESEARCH AND DEVELOPMENT IN ITALY

M. Ziffero 1968 25 p refs Presented at IAEA Panel on Sol-Gel Processes, Vienna, 6-10 May 1968

IRT/CHII(68)28) Avail: CFSTI

Cursory research on sol-gel started at CNEN early in 1963; the preliminary results obtained on thorium and the increasing interest in fast reactor fuels suggested a larger program. Today a group of approximately twenty is engaged in full time activity on sol-gel development involving an annual budget of approximately \$350,000. This sum however does not include the construction of special facilities (such as alpha labs) and the cost of the irradiation programs. Research on sol-gel follows parallel lines which include: basic chemistry of actinides in colloidal solution, mechanism of gelification and sintering; process chemistry and establishment of flow sheets; process development and research on specific unit operations; product evaluation, irradiation testing, economics. A description given of the results achieved along the different lines.

Author

N69-11230# Brookhaven National Lab., Upton, N. Y.

HYBRID FOSSIL-NUCLEAR FUELED MHD POWER CYCLES

M. Steinberg, J. Powell, M. Beller, and B. Manowitz Jun. 1968 15 p ref

(BNL-12569) Avail: CFSTI

A description is given of three alternate combination fossil nuclear fueled MHD power cycles (combination of a coal gasifier with a MHD generator): H₂-O₂, CO-O₂, and CO + H₂-air. The reforming and combustion reactions in each cycle are described, and their advantages and disadvantages are compared. Energy balances and efficiencies are given. The original conceptual cycle is described in BNL-12319-R.

NSA

N69-13334# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

COMPOSITION AND THERMODYNAMIC PROPERTIES OF THE COMBUSTION PRODUCTS OF NATURAL FUELS WITH IONIZING ADDITIVES [SOSTAV I PERMODINAMICHESKIYE SVOISTVA PRODUKTOV SGORANIYA PRIRODNYKH TOPLIV S IONIZIRUYUSHCHIMI DOBAVKAMI]

V. C. Yungman et al. *In* its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 221-232 refs (See N69-13314 03-03)

(SM-74/217) Avail: CFSTI

For the construction and operation of magnetohydrodynamic converters of thermal energy into electrical energy, operating on natural fuel, it is necessary to have information about the equilibrium composition and the thermodynamic properties of the combustion products of natural fuels with ionizing additives. Pertinent computations were carried out for the combustion of methane in air and in air-oxygen mixture for a wide range of temperatures and pressures and for different proportions of the fuel and the oxidant, both with and without ionizing additive. The results of these computations, in the form of i-s diagrams and tables of the equilibrium composition, are mentioned.

Author

N69-15081# Mound Lab., Miamisburg, Ohio.

CRITICALITY ANALYSIS OF THE LARGE HEAT SOURCE SYSTEM CONTAINING PLUTONIUM 238 DIOXIDE FUEL

R. A. Wolfe 1 Oct. 1968 9 p refs

(Contract AT(33-1)-GEN-53)

(MLM-1532) Avail: CFSTI

A criticality analysis was made of a ²³⁸PuO₂ radioisotope heat source system that will provide 25 kW of thermal power to a Brayton cycle power conversion system designed for space application. The calculations revealed a considerable degree of subcriticality for the Large Heat Source System. The only credible mechanism that could result in criticality of the ²³⁸Pu-fueled Large Heat Source System would be a massive meltdown of the capsules and reassembly of approximately one-fourth of the fuel in some container such as a reentry body. The occurrence of criticality would not create significant additional radiological hazards beyond or different in magnitude than those posed by possible fuel dispersal.

Author (NSA)

N69-15237# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

RESULTS FROM USAEC PLUTONIUM UTILIZATION PROGRAMS CONDUCTED BY BATTELLE-NORTHWEST

F. G. Dawson, comp. 28 Aug. 1968 101 p refs Presented at the Intern. Atomic Energy Agency Panel on Plutonium Util., Vienna, 2-6 Sep. 1968

(Contract AT(45-1)-1830)

(BNWL-SA-2065; CONF-680924-1) Avail: CFSTI

A status report on the present technology of Pu is presented. Topics discussed include: Pu utilization; fuel characteristics of Pu; fuel fabrication; physics behavior; and Pu fueling in water reactors.

NSA

N69-15543# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

PHOENIX FUEL EVALUATION IN A MARITIME REACTOR DESIGN

K. R. Wise and U. P. Jenquin Oct. 1968 38 p refs

(Contract AT(45-1)-1830)

(BNWL-851) Avail: CFSTI

The Consolidated Nuclear Steam Generator-II reactor concept was used as a reference design to compare fuel cycle costs for Pu fueled cores with a high ²⁴⁰Pu content (Phoenix fuel) to costs for an enriched U base case core. The Phoenix fuel was found to be competitive with the slightly enriched U reference fuel. Results

are presented in graphical and tabular form, and the results and calculational methods are discussed. NSA

N69-17117# Gulf General Atomic, San Diego, Calif.
HTGR FUEL REPROCESSING: EFFECTS OF INCLUDING A SILICON CARBIDE COATING ON FERTILE FUEL PARTICLES

J. J. Shefcik 10 May 1968 16 p refs
 (Contract AT(04-3)-167)
 (GAMD-8661) Avail: CFSTI

Conceptual flow sheets and reprocessing costs were developed for recovery of thorium and uranium from HTGR fuel elements containing silicon carbide-coated fissile and fertile particles. Two cases were considered. In Case IIIB the fertile particles were processed, and the fissile particles isolated, packaged and stored for eventual disposal or future processing. In Case IIIB1, both types of particles are processed to recover the contained uranium. Flow sheets and costs were derived from those contained in an earlier study where only the fissile particles had a silicon carbide coating. A modified burn-leach head-end process is used to prepare the fuel components for separation and decontamination by solvent extraction. The estimated costs associated with the two cases are listed. The reprocessing charges given assume plant operation at its design capacity. No credit is included for the recovered thorium or fissile particle uranium. The incremental cost of recovery of the fissile particle uranium is \$0.45. Author (NSA)

N69-17558# Oak Ridge National Lab., Tenn.
FUEL-CYCLE COST COMPARISONS FOR LOW ENRICHED URANIUM HIGH TEMPERATURE GAS-COOLED REACTORS

Don Steiner 9 Sep. 1968 57 p refs
 (Contract W-7405-ENG-26)
 (ORNL-TM-2173) Avail: CFSTI

Multigroup point-depletion physics calculations are performed for equilibrium fuel cycles without recycle; thermal-hydraulic performance and fuel cycle costs are determined for three fuel element designs. Power densities and pressure drops are calculated. Reactor design and operations parameters are given. Economics are detailed; data for the three fuel element designs are tabulated. NSA

N69-19229# Oak Ridge National Lab., Tenn.
DIFFUSION PROCESS FOR REMOVING TRITIUM FROM THE BLANKET OF A THERMONUCLEAR REACTOR

A. P. Fraas Dec. 1968 24 p refs
 (Contract W-7405-ENG-26)
 (ORNL-TM-2358) Avail: CFSTI

The tritium concentration in the blanket of a thermonuclear reactor is important both from the standpoint of its effect on the capital investment required and from the standpoint of possible embrittlement of the structural material. The size and cost of the system required to keep the tritium concentration to an acceptable level are important from the feasibility standpoint. The high diffusion coefficient for H diffusing through Nb makes it possible to design a tritium removal system for thermonuclear reactors. The proposed system entails tritium diffusion from the Li of the blanket as it circulates through the main heat exchangers built of Nb. These would be operated at about 1800°F and be used to boil potassium for a potassium vapor topping cycle. A stainless steel potassium condenser operating at about 1100°F would serve not only as the boiler for a steam cycle but it would also be designed to concentrate the tritium which would be drawn off as a noncondensable. Author (NSA)

N69-19605# Oak Ridge National Lab., Tenn. Metals and Ceramics Div.

COATED-PARTICLE FUELS

T. G. Godfrey, R. L. Beatty, J. L. Scott, J. H. Coobs, J. W. Prados, et al Nov. 1968 142 p refs

(Contract W-7405-ENG-26)
 (ORNL-4324) Avail: CFSTI

Information was surveyed on fabrication, characterization performance, and reprocessing plutonium, thorium, or uranium coated-particle fuels with emphasis on pyrolytic carbon-coated oxides and carbides. Processes used in fabrication include powder rolling and sintering, particle melting and sol-gel. Properties of pyrolytic-carbon coatings and their dependency on coating conditions are discussed. Radiation effects on mechanical properties and dimensional changes and fission product retention behavior are given. The burn-leach and grind-leach processes for fuel reprocessing are described. NSA

N69-20205# Army Foreign Science and Technology Center, Washington, D. C.

GROWTH OF MICROORGANISMS IN MEDIA WITH PETROLEUM FUELS

N. N. Grechushkina 1968 9 p refs Transl. into ENGLISH from Vestn. Mosk. Univ. Ser. Vi: Biol. Pochvoved. (Moscow), v. 23, no. 2, 1968 p 122-124

(AD-680804; FSTC-HT-23-785-68) Avail: CFSTI CSCL 6/13

It was ascertained that representatives of both *Mycobacteria* and *Pseudomonas* can grow in kerosene TS-1 and T-1, diesel and hydrogenated fuels. *Mycobacteria mucosum* and *M. lacticolum* grow well in kerosene and hydrogenated fuels. Diesel fuel with a sulfur content of 1.6% was utilized slightly by them; gasoline was not used at all. *Pseudomonas* grow well in kerosene TS-1 and T-1 and diesel fuel, and hydrogenated fuel and gasoline B-70. Thus, of all tested microorganisms, only the strain *Pseudomonas pyocyanum* can grow in aeronautical gasoline. The intensity of growth of various strains of the same bacteria in the same fuel is not uniform. Author (TAB)

N69-21442# Israel Program for Scientific Translations, Ltd., Jerusalem.

NEW METHOD OF INVESTIGATING THE STRENGTH PROPERTIES OF TYPICAL ROCKS IN SOME COAL AND SHALE DEPOSITS

M. I. Koifman et al In its Mech. Properties of Rocks 1968 p 87-96 refs

Copyright. Avail: CFSTI

An effective method was applied in testing the strength of coals, combustible shales, aleurolites, sandstones, and limestones of low or medium strength. The method is distinguished by its simplicity and by the fact that several tensile and compression tests can be performed on each specimen. The new method was the first to afford a means of testing the strength of weak and fissured rocks or coals from which test pieces for testing by previously known methods cannot be prepared in practice, and which, as a consequence, could not be tested. A ratio of compression strength to tensile strength was determined for the samples tested; this ratio is an indicator for plasticity or brittleness. Author

N69-25510# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

TREATMENT OF FUEL BY THE DRY METHOD. STUDIES PERFORMED IN FRANCE [TRAITEMENT DES COMBUSTIBLES PAR VOIE SECHE. ETUDES REALISEES EN FRANCE]

M. Bourgeois and P. Faugeras 1968 7 p refs In FRENCH Presented at Symp. on Nonaqueous Reprocess., Mol. Belgium, 28 Oct. 1968

(CEA-CONF-1195; CONF-681040-9) Avail: AEC Depository Libraries

Methods for treatment of fuels of uranium-base alloys and PuO_2-UF_6 , based on the selective volatilization of UF_6 and PuF_6 , are described. Mechanical and chemical decladding procedures and economic aspects of the treatment are included. NSA

03 OTHER PRIMARY ENERGY SOURCES

N69-25563# Argonne National Lab., Ill.

NONAQUEOUS FUEL PROCESSING: RESEARCH CONDUCTED IN FRANCE

M. Bourgeois and P. Faugeras 1968 5 p ref Transl. into ENGLISH from French Conf. Presented at Symp. on Nonaqueous Reprocess., Mol. Belgium, 28-29 Oct. 1968 (ANL-Trans-704; CONF-681040-1) Avail: CFSTI

A research program dealing with nonaqueous irradiated fuel reprocessing is described first for alloys based on enriched uranium and then for breeder reactor fuels. Finally, a technical and economic comparison between the aqueous and nonaqueous processes is made. Author (NSA)

N69-26099# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SPECIALIZED COMPUTER FOR THE CALCULATION OF OPTIMUM PARAMETERS OF TECHNOLOGICAL PROCESSES

A. S. Ruppo 14 May 1968 14 p Transl. into ENGLISH from Mekhaniz i Avtomatiz. Proizv. (Moscow), v. 20, no. 9, 1966 p 41-44

(AD-682791; FTD-HT-23-27-68) Avail: CFSTI CSCL 09/2

An analysis is made of a specialized computer designed to solve the problem of increasing the output of a coal treatment plant. The computer consists of a section for input of initial data in the form of enrichment curves, sections for computing values of the coordinates of these curves, units for input of values of the coefficients q_i and the assigned value of average ash content of the overall concentrate, the decision element, the null-balance device, and the output unit. The computer works as follows: the values of average ash content of the concentrate and coefficient q_i are loaded into the computer to determine the fraction of each of the classes of coal in percent of the total. During the process of solution, the values of the coordinates of the enrichment curves are calculated at points of equal derivatives $M_1 = M_2M_3$ and the differential equations are solved at these points. When equality is achieved between the two halves of the equation, the null-balance device operates and the computing process is halted. The output device can be used to develop all the data of interest to the operator, such as total concentrate yield, yield of concentrate by classes, etc. Author (TAB)

N69-28160# National Academy of Sciences--National Research Council, Washington, D.C. Div. of Engineering.

USEFUL APPLICATIONS OF EARTH-ORIENTED SATELLITES: GEOLOGY

1969 73 p refs

(Contract NSR-09-012-909)

(NASA-CR-101384) Avail: CFSTI CSCL 08G

Two primary goals are defined for the application of earth-oriented satellites to geology. (1) Regional geologic photomaps of North and South America could be provided by color photography from spacecraft and radar imagery from aircraft. These maps would serve as an aid to the exploration geologist in the search for new deposits of minerals and petroleum. (2) Spectral properties of minerals and rocks at various wavelengths could be studied to determine rock identity and geologic structure and also to recognize lithologic and structural conditions favorable for the occurrence of economic deposits of minerals and petroleum. A two phase program is proposed. The initial system, to be put into operation in two to three years, would consist of combined satellite-aircraft approach designed to provide useful geologic maps of the Americas. Later, sensing techniques that are more sophisticated than photography and radar would be used to determine detailed geological structure and rock identity. J.A.M.

N69-29789# Joint Publications Research Service, Washington, D.C.

CHEMISM AND PHYSICOCHEMICAL PROPERTIES OF

PROCESSES OF MICROBIOLOGICAL OXIDATION OF PETROLEUM HYDROCARBONS

V. I. Karban et al 3 Jun. 1969 44 p refs Transl. into ENGLISH from USP. Khim. (Moscow), v. 38, no. 3 1969 p 539-559 (JPRS-48150) Avail: CFSTI

The article presents a survey of literature on the microbiological synthesis of protein substances from petroleum hydrocarbons. A general description is given of the process and the conditions of its occurrence, as well as the chemical mechanism of the microbiological oxidation of aliphatic, aromatic, and heterocyclic hydrocarbons. Particular attention is given to physicochemical and topochemical peculiarities of the process. It is shown that from the physicochemical viewpoint the process under consideration resembles emulsion oxidation of hydrocarbons. Author

N69-30776# International Atomic Energy Agency, Vienna (Austria).

NUCLEAR TECHNIQUES AND MINERAL RESOURCES

1969 518 p refs Proc. of the Symp. on the Use of Nucl. Tech. in the Prospecting and Develop. of Mineral Resources, Buenos Aires, 5-9 Nov. 1968

Avail: CFSTI

The conference proceedings focused on ore geophysics and processing, uranium exploration, radioisotope X-ray fluorescence, and activation analysis. For individual titles, see N69-30777 through N69-30806.

N69-30790# Gearhart-Owen Industries, Inc., Fort Worth, Tex.

GAMMA-RAY LOGGING IN URANIUM PROSPECTING

W. K. Hawkins and M. Gearhart In Intern. Atomic Energy Agency Nucl. Tech. and Mineral Resources 1969 p 213-222 refs

(SM-112/15) Avail: CFSTI

Gamma ray systems that have a wide range response are required for uranium exploration. Low grade ore bodies with marginal economic feasibility are particularly dependent on reliable, calibrated gamma ray logs. Wide range gamma ray counting systems for this purpose are described, with emphasis on the downhole wide range gamma-gross count probe. Gamma detector types, calibration of the system, and interpretation methods are reviewed. The hardware characteristics are detailed to provide an understanding of equipment capabilities and limitations. It is necessary to discriminate between the valuable uranium ore and other radioactive materials, at present of little value. Gamma spectral logs are of considerable interest but available equipment limits the use of such techniques. Equipment limitations and possible improvements are covered. Author

N69-30799# Ministerul Petrolului, Ploesti (Romania).

NUCLEAR TECHNIQUES CURRENTLY USED IN OIL FIELD EXPLOITATION

G. Petcu In Intern. Atomic Energy Agency Nucl. Tech. and Mineral Resources 1969 p 383-396 refs

(SM-112/24) Avail: CFSTI

A general survey is given of the present status and prospects of the techniques of nuclear geophysics, which are classified as follows: methods concerned with the investigation of geological formations, from the point of view of lithologic nature, content of clay, dolomite, anhydrite, etc., and based on the study of natural and induced radioactivity (making use of gamma and neutron radiation); methods concerned with petrophysical parameters (density, porosity, etc.), by means of which the collecting capacity of prospected geological formations can be qualitatively and quantitatively determined; methods for determining the nature of fluids present in deposits; and radiotracer methods, which are used extensively in the drilling, construction and operation of oil wells.

and also in various techniques concerned with exploitation of deposits, and secondary recovery. Particular importance is given to the development of spectral analysis in the study of natural, scattered and induced gamma-radiation, and also to radioactive tracer techniques. Author

N69-30800# Mobil Research and Development Corp., Dallas, Tex. Field Research Lab.

ADVANCES IN NUCLEAR GEOPHYSICAL METHODS IN OIL GEOLOGY AND ROCK ANALYSIS

R. L. Caldwell, W. R. Mills, and W. W. Givens /In Intern. Atomic Energy Agency Nucl. Tech. and Mineral Resources 1969 p 397-413 refs

(Contract NASw-1435)

(SM-112/25) Avail: CFSTI

A summary is presented of a two year extensive study of the combination neutron method for analyzing surface rocks of the moon and planets. The combination method uses a pulsed accelerator source of 14-MeV neutrons and measurement of prompt gamma rays, capture gamma rays, activation gamma rays, and thermal and epithermal neutron die-away. As a result the new technique of cyclic neutron activation was developed which is applicable to lunar surface analysis, borehole logging, and on-stream analysis of rocks and minerals. Rock analysis studies have been made with a high resolution lithium-drifted germanium detector and a pulsed accelerator source of neutrons. The detector resolution of 0.5% at 1.3 MeV is about an order of magnitude better than for a good sodium iodide detector. Gamma rays arising from inelastic scattering of fast neutrons, capture of fast and slow neutrons, and activation were studied. From the results with the high resolution detector some interesting conclusions and speculations are made concerning the future of nuclear elemental analysis in the field. A new small-diameter pulsed accelerator neutron tool for logging through 2 1/2-in. tubing is described, and a pulsed neutron source using a plurality of alpha sources and beryllium targets with a rotatable shutter between them. Author

N69-30801# Institut de Physique Atomique, Cluj (Rumania).

MEASUREMENT OF ISOTOPIC DISTRIBUTION IN THE EVALUATION OF OIL FIELDS [MESURE DE LA DISTRIBUTION ISOTOPIQUE DANS L'EVALUATION DES GISEMENTS PETROLIFERES]

L. Blaga /In Intern. Atomic Energy Agency Nucl. Tech. and Mineral Resources 1969 p 415-432 refs In FRENCH; ENGLISH summary

(SM-112/27) Avail: CFSTI

A general discussion is presented on the isotopic concentrations in newly opened hydrocarbon deposits which show certain regularities of distribution. The isotopic distribution existing between the different components of the fluids in oil-bearing deposits are the result of isotopic equilibrium or of a process tending towards such equilibrium. Agreement was obtained between the calculated values and those obtained, for example, in the methane-deposit water system. The isotopic concentration gradients, recorded over considerable distances within one phase, are primarily the result of a geothermal gradient. Two characteristic phases are noteworthy from the point of view of the distribution of isotopic concentration gradients in hydrocarbon deposits: (1) The starting phase of isotopic distribution, pre-existing in the deposit, is a result of the temperature gradients. This distribution can be incorporated in a system of isotopic isoconcentrates (lines of equal isotopic concentration), which can be correlated with the structure of the deposit and also with the various physical, chemical and mechanical factors characteristic of porous media. (2) The secondary phase of isotopic distribution corresponds to the period of operation. The exploitation process results in imbalances due to pressure and water flooding and in large-scale movements of oil from one zone to another. If the isotopic distribution of the starting phase is seen as

an initial, natural isotopic labelling, it would appear possible to follow the changes in initial distribution as the exploration operations go on. Author

N69-31081# European Atomic Energy Community, Ispra (Italy). Reactor Physics Dept.

CAN THORIUM COMPETE WITH URANIUM? AN ASSESSMENT FOR HEAVY-WATER AND GRAPHITE MODERATED REACTORS

G. Graziani, C. Rinaldini, C. Zanantoni, J. J. Devos, and M. Paruccini May 1969 70 p refs

(EUR-4264.e) Avail: CFSTI

The cost of thorium fuel cycles with fully enriched uranium make-up and of natural and enriched uranium fuel cycles was investigated for D₂O moderated pressure tube and pressure vessel reactors and high-temperature gas-cooled reactors. The fuel cycle cost was optimized by a parametric investigation of burn-up, specific power and moderation ratio. A continuous charge-discharge fueling was assumed, with full recycle, partial and segregation schemes. The comparison between the fuel cycle costs of the uranium and thorium cycle shows a slight advantage for thorium under present economic conditions. The economic conditions which should be realized in order to make thorium more competitive are investigated by means of a parametric survey of the cost of fabrication, reprocessing, ore and separative work. Author

N69-31119# European Atomic Energy Community, Ispra (Italy).

PYROMETALLURGICAL CONCENTRATION OF ENRICHED URANIUM IN IRRADIATED MTR FUEL ELEMENTS [CONCENTRATION PYROMETALLURGIQUE DE L'URANIUM ENRICHI DANS LES ELEMENTS COMBUSTIBLES MTR IRRADIES]

C. David, J. M. Junger, R. Lorenz, P. Montellanico, and J. G. Wurm Brussels May 1969 20 p In FRENCH; ENGLISH summary Presented at Symp. on Dry Reprocessing, Mol, Belgium, 28-29 Oct. 1968

(EUR-4243.f) Avail: CFSTI

The purpose of this process to be performed on the MTR reactor site, is to reduce: (1) the transportation costs of the uranium to the aqueous plant; and (2) the processing costs (reduced handling, smaller, liquid waste volume). This method consists in melting down the fuel element (aluminum type) and concentrating the fissile material by precipitation through the addition of magnesium in which uranium is insoluble. The enriched uranium, concentrated at the bottom of the ingot as an intermetallic compound is cut off and shipped away. The laboratory experiments indicated that an uranium volume concentration of 20:1 is possible. A furnace was installed in the hot cell of the Ispra I reactor to melt spent MTR fuel elements. The first experiments performed on MTR dummy elements have demonstrated that the same results as for the laboratory experiments can be obtained. Author

N69-31161# Kernforschungszentrum, Karlsruhe (West Germany).

PHYSICS INVESTIGATIONS OF URANIUM-FUELED FAST STEAM-COOLED REACTORS IN SNEAK ASSEMBLIES 3A-0, 3A-2, 3A-3

R. Schroeder, comp. Oct. 1968 87 p refs Sponsored by US-EURATOM

(EUFNR-608; KFK-847; EUR-3721.e) Avail: AEC Depository Libraries

Experiments on the SNEAK-3A series of assemblies are described for the physics characteristics of fast steam-cooled uranium reactors of about 500 l core volume at operating steam density. The steam was simulated by polyethylene foils. Two of the assemblies, corresponding to 40% (3A-1) and to 100% (3A-2) of the normal coolant density, have been investigated in considerable detail. Two more assemblies, investigated in less detail, have been obtained by voiding part of the core of assembly 3A-1 (viz. 3A-0) and by doubling the thickness of the polyethylene foils in part of

03 OTHER PRIMARY ENERGY SOURCES

the core of assembly 3A-2 (viz. 3A-3). The experiments done at assembly 3A-0 and those done at assemblies 3A-2 and 3A-3 are discussed. Many of the experimental data are of direct interest to the designer of a steam-cooled fast breeder reactor, e.g., the critical mass, the reactivity coefficient of the coolant density and the ratio of the capture rate of ^{238}U to the fission rate of ^{235}U as a function of position, that is closely related to the breeding ratio.

Author (NSA)

N69-31272# Atomic Energy Commission, Washington, D.C.

SELECTED BACKGROUND INFORMATION ON URANIUM ENRICHING

Mar. 1969 56 p refs

(ORO-668) Avail: US AEC Div. of Tech. Inform. Extension, P.O. Box 62, Oak Ridge, Tenn. 37830 at no cost

The seven separate steps of the nuclear fuel cycle (mining and milling, UF_6 conversion, enrichment, fabrication, irradiation, shipping, and reprocessing) are discussed. Typical cost experience for each step is included, with special emphasis placed on the enrichment step and its relation to the over-all fuel cycle. A description of gaseous diffusion plants is presented, including options and costs for increasing uranium enrichment capabilities. Current and long-term operational planning for optimization of power procurement, plant improvements, new plant additions, and level of preproduction are presented. Estimates are given of costs for operation of existing gaseous diffusion plants and capital investments for process improvements to the plants and construction of new plants.

NSA

N69-31541# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Lab.

SAVANNAH RIVER LABORATORY ISOTOPIC POWER AND HEAT SOURCES. PART 1: Co-60 Quarterly Progress Report, Oct.-Dec. 1968

H. S. Hilborn comp. Feb. 1969 19 p refs

(Contract AT(O7-2)-1)

(DP-1192-1) Avail: CFSTI

Preliminary (theoretical) analyses indicated that CoO and CoO-MgO solid solutions are promising high temperature fuel forms of ^{60}Co . Extrapolation of stress-rupture data from the literature indicated that superalloy capsules will perform satisfactorily for 5 years at 1000°C or higher. Haynes 25 had the highest long-term strength of the materials tested. Satisfactory performance of an inactive Inconel 600 capsule at 1000°C for 10,000 hr (1.14 yr) was confirmed by destructive examination. More internal reaction than expected was revealed by destructive examination of two active capsules after 10,000 hr at 900°C .

Author (NSA)

N69-31655# Kernforschungszentrum, Karlsruhe (West Germany). Institut fuer Reaktorentwicklung.

FAST REACTOR CORE HEAT REMOVAL

D. Smidt Nov. 1968 38 p refs

(EURFNR-615; KFK-883; EUR-4162) Avail: AEC Depository Libraries

The problem of optimizing fast reactor design parameters while maintaining sufficient core cooling potentials is analyzed. The reactor model discussed has a core of multiple parallel metal clad rods filled with $\text{PuO}_2\text{-UO}_2$. Coolant possibilities which are analyzed include: gas, steam; and liquid Na.

NSA

N69-31987 Purdue Univ., Lafayette, Ind.

FAST REACTOR BLANKET MANAGEMENT

James Madison Tilford (Ph.D. Thesis) 1968 289 p

Avail: Univ. Microfilms: HC \$13.05/Microfilm \$3.75 Order No. 69-2986

Present-day concepts of fast breeder reactor design call for fixed breeder blankets of natural or depleted uranium. This

investigation was undertaken in order to determine an optimum blanket management scheme. Three types of radial blankets were considered: a one-batch stationary blanket, an in-out cycle, and an out-in cycle. The 1000-MWe Karlsruhe Na-1 Fast Breeder Reactor was chosen as the reference reactor for this study because it is typical of present-day fast breeder concepts. This system is fueled with uranium-plutonium oxide, sodium cooled, and contains a natural UO_2 radial blanket. The results of the physical analyses indicate that the out-in and in-out blanket cycles have more favorable Pu^{239} distributions than the stationary blanket. This advantage results in lower heat generation and burnup rates, less neutron leakage, and larger breeding ratios than for the stationary case.

Dissert. Abstr.

N69-33683# HRB-Singer, Inc., State College, Pa.

DETECTION, DELINEATION, AND MONITORING OF SUBSURFACE COAL FIRES BY AERIAL INFRARED SCANNING

W. M. Knuth, W. Fisher, Jr., and R. W. Stingelin. In Mich. Univ. Proc. of the 5th Symp. on Remote Sensing of Environment Sep. 1968 p 877-881 ref

Avail: CFSTI

Coal mining regions have been plagued for many years by the noxious effects of subsurface coal fires which begin beneath the culm, or coal refuse piles, and often burn into abandoned underground mines. The effectiveness with which these fires can be extinguished or controlled is largely dependent upon their early detection and accurate location. Drilling techniques are currently the most widely used means of delineating subsurface fires. Aerial infrared scanning, however, has the advantages of being more economical and faster and can provide a visual synoptic record. Modification of the scanning system permits electronic differentiation of the signal and provides for manual control of the level and gain settings of the amplifier. Improved detection of thermal detail in the fire areas resulted from such modification. The images reveal significant surface radiation variations from which inferences can be drawn regarding the extent and intensity of the fires.

Author

N69-34967# Nuklear-Chemie Und -Metallurgie, G.m.b.H., Wolfgang Bei Hanau (West Germany).

TECHNOLOGICAL IMPROVEMENT IN THE FABRICATION OF CAST URANIUM CARBIDE RODS Final Report [VERBESSERUNG DER TECHNOLOGIE BEI DER FABRIKATION GEGOSSENER URANKARBID-STABE]

P. Himmelstein, H. Kuhn, O. Pfahls, and R. Lucas (EURATOM) Jun. 1969 40 p refs in GERMAN; ENGLISH summary

(Contract EURATOM-246-66-1 ORGD)

(EUR-4273.D) Avail: CFSTI

The aim was to develop a process for the economic fabrication of the nuclear fuel uranium monocarbide for the type of reactor developed in the Orgel Project. Work began with studies on the fabrication of uranium carbide from uranium dioxide and graphite powder. At the same time preliminary smelting tests were performed with small arc furnaces. The most favorable powders for the solid-state reaction together with the optimum conditions for the reaction were determined. Comprehensive studies were initiated on the influence of smelting conditions on the quality of uranium carbide rods. In arc smelting it was found that despite certain technical difficulties vacuum smelting was more suitable than shielding-gas smelting for the preparation of uranium carbide on a relatively large scale with a very low impurity fraction. Since the Orgel design requires uranium carbide rods to be fabricated with a well-defined surface area, all-round grinding of the rods is necessary. An account is given of the techniques used in cylindrical, cut-off, face and dishing grinding. The factors influencing the profitability of the process are discussed.

Author

N69-36240# Combustion Engineering, Windsor, Conn.
REVIEW OF FBR CORE DESIGN PROBLEM AREAS
 R. C. Noyes *In Am. Nucl. Soc. Fast Reactor Systems, Mater. and Components* [1969] p 437-444 refs
 Avail: CFSTI

The FBR core design procedures are described. Topics discussed include: fuel cycle costs; flow characteristics in core; and heat transfer. NSA

N69-36243# Commonwealth Edison Co., Chicago, Ill.
UTILITY REQUIREMENTS IN FAST BREEDERS
 C. B. Zitek *In Am. Nucl. Soc. Fast Reactor Systems Mater. and Components* [1969] p 454-458
 Avail: CFSTI

The economic requirements for the development of fast breeder power reactors are analyzed as seen by the utility company. NSA

N69-37355# Dow Chemical Co., Golden, Colo. Rocky Flats Div.

FLUORIDE VOLATILITY Conference Proceedings
 J. M. Cleveland, ed. and M. A. Thompson, ed. Oak Ridge, Tenn. AEC 1968 209 p refs Conf. Held at Rocky Flats, Colo., 24-25 Jun. 1968
 (Conf-680610) Avail: CFSTI

CONTENTS:

1. THE CHEMISTRY OF PLUTONIUM HEXAFLUORIDE
 M. J. Steindler (Argonne Natl. Lab., Ill.) p 2-17 ref
2. FLUORIDE VOLATILITY PROCESSES: FLUORINATION OF URANIUM AND PLUTONIUM N. M. Levitz (Argonne Natl. Lab., Ill.) p 18-41 refs
3. FLUORIDE VOLATILITY LABORATORY STUDIES
 R. S. Marshall p 42-50 refs
4. USE OF CHEMICAL VAPOR DEPOSITION TO CONVERT HALIDES TO FISSIONABLE FUEL COMPOUNDS W. C. Robinson, Jr., J. I. Federer, and W. R. Martin (Oak Ridge Natl. Lab.) p 51-62 refs
5. VOLATILITY STUDIES WITH IRRADIATED FUELS
 A. A. Chilenskas (Argonne Natl. Lab., Ill.) p 63-64 refs
6. DEVELOPMENT OF VOLATILITY PROCESSES FOR THERMAL AND FAST REACTOR FUELS A. A. Jonke (Argonne Natl. Lab., Ill.) p 65-78
7. A FLUIDIZED-BED FLUORIDE VOLATILITY PILOT PLANT FOR PLUTONIUM PURIFICATION R. L. p 79-98
8. THE OAK RIDGE GASEOUS DIFFUSION PLANT FUEL REPROCESSING PROGRAM J. R. Merriman and J. H. Pashley (Union Carbide Corp., Oak Ridge, Tenn.) p 99-129 refs
9. FLUORINATION OF ALL ENRICHMENTS OF URANIUM OXIDES J. G. Crawford (Goodyear Atomic Corp., Portsmouth, Ohio) p 130-139
10. PROCESS CHEMISTRY OF NEPTUNIUM HEXAFLUORIDE
 L. E. Trevorrow (Argonne Natl. Lab., Ill.) p 140-160 refs
11. CRITICALITY CONSIDERATIONS IN FLUORIDE VOLATILITY PROCESSING C. L. Schuske p 161-165
12. CONTAINMENT OF PuF_6 R. W. Kessie (Argonne Natl. Lab., Ill.) p 166-184 refs
13. ENGINEERING OF A PRODUCTION PROTOTYPE FLUORIDE VOLATILITY SYSTEM O. E. Heady p 185-198

N69-37567# Oak Ridge National Lab., Tenn.
REACTOR EVALUATION STUDIES

In its Chem. Technol. Div. Sep. 1968 p 225-237 refs (See N69-37551 22-06)
 Avail: CFSTI

Continuing studies of various advanced reactor and fuel-cycle systems to determine engineering and economic feasibility are reported. Included are cost studies of shipping fresh and spent nuclear fuel; reprocessing spent fuel; and preparing various virgin and recycle fuel materials (oxides, metals, fluorides, etc.), primarily in support of the evaluation of civilian nuclear power for the period 1970-2020. Computer codes were developed to calculate rational growth patterns for the fuel cycle industry and to make projections of cost versus time for the various steps in the fuel cycle, based on both marketplace (nonoptimal) and optimal economic models. A computer code, was written to calculate individual fission product isotopes, fission product elements, groups of chemically similar elements, and their gross totals, as well as beta and gamma decay heat release rates. The program also calculates gamma photon release rates in terms of 16 energy groups for use in shielding calculations. Author

N69-38022# Commissariat à l'Energie Atomique, Marcoule (France). Centre de Production de Plutonium.

THE USEFULNESS OF THE DECAY RATE IN THE MANAGEMENT OF RADIOACTIVE WASTE STOCKS [DE L'INTERET DE LA DECOISSANCE POUR LA GESTION DES DECHETS RADIOACTIFS]

Jean Rodier and Gérard Cohendy May 1969 24 p refs *In FRENCH; ENGLISH summary*
 (CEA-R-3731) Avail: CFSTI

It became apparent, during the first few years operation of the Marcoule Center, that it was very useful to exploit the natural decay rate of the radioactive element contaminating the heat release rates. The program also calculates gamma photon release rates in terms of 16 energy groups for use in shielding calculations. Author

N70-12102*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

COMPARISON OF ASTM-A1 AND NATURAL GAS FUELS IN AN ANNULAR TURBOJET COMBUSTOR

Donald F. Schultz, Porter J. Perkins, and Jerrold D. Wear 20 Oct. 1969 27 p refs
 (NASA-TM-X-52700) Avail: CFSTI CSCL 21H

A preliminary study was made to determine possible problem areas in the use of natural gas fuel in aircraft turbojet combustors. A combustor designed for Mach 3.0 cruise operation with liquid ASTM-A1 fuel was operated with natural gas. The only change made to the combustor was in the fuel nozzle itself. Only one natural gas fuel nozzle design was used for these tests. Combustion efficiency, outlet temperature profiles, blowout and relight characteristics, flame radiation and smoke emission data were obtained. A comparison was made with data obtained from the same combustor using liquid ASTM-A1 fuel. The major problems encountered with natural gas were poor ignition and blowout characteristics. Author

N70-12263*# National Academy of Sciences-National Research Council, Washington, D.C. Div. of Earth Sciences.

SEISMOLOGY: RESPONSIBILITIES AND REQUIREMENTS OF A GROWING SCIENCE. PART 1: SUMMARY AND RECOMMENDATIONS

1969 45 p Sponsored in part by AROD, AEC, ARPA, ESSA, NSF, and US Geol. Survey
 (Contract NSR-09-012-915)
 (NASA-CR-107020) Avail: CFSTI CSCL 08K

The current status and role of seismology in society, a forecast of the future role, and recommendations for developing the

03 OTHER PRIMARY ENERGY SOURCES

technical capability required to meet current and future needs are summarized. Means of attaining the goals of mitigating, predicting, and even preventing earthquakes are described, as well as increased investigation of the earth's crust and deep interior. The capabilities of the future observational and laboratory facilities, and the research and training facilities at universities are outlined. Some of the uses of seismology are identified and as exploration of underwater, oil, and mining resources, and state and federal interests are reviewed. Graduate students and graduate programs, and federal funding in seismological research are also covered. N.E.N.

N70-12423# Oak Ridge National Lab., Tenn.
PHYSICS, THERMAL HYDRAULIC, AND FUEL CYCLE COST ANALYSES OF A METALLIC URANIUM DIRECT REPLACEMENT FOR PWR'S

F. G. Welfare and J. E. Jones 11 Jul. 1969 40 p refs
(ORNL-TM-2493) Avail: CFSTI

The Diablo Canyon pressurized water reactor is analyzed with the oxide fuel replaced by annular metal pins. Thermal-hydraulic, physics, and fuel-cycle economics analyses are presented. The results show possible savings of up to .3 mills per kilowatt hour electric in fuel cycle costs. The possible effects of uncertainties in physics results, physics procedures, and fuel element performance are considered. The effect of these uncertainties may be to reduce the saving in fuel cycle cost to less than .1 mill per kilowatt hour electric. Perhaps the most significant result is that the metal fueled systems have the potential for sharply reducing the separative work and ore requirements for an industry of pressurized water reactors.

Author (NSA)

N70-12921# Geological Survey, Denver, Colo.
POTENTIAL APPLICATIONS OF NUCLEAR EXPLOSIVES TO THE RECOVERY OF GEOTHERMAL ENERGY Progress Report for Fiscal Year 1965

Howard H. Waldron Jun. 1969 20 p refs *Its Geothermal Energy-1*

(Contract AT(04-3)-289)
(USGS-289-1) Avail: CFSTI

The initial phase of study and the utilization of nuclear explosives for stimulating and benefiting the recovery of geothermal energy have been directed toward fundamentals that may control or influence the occurrence and character of geothermal areas. Some characteristics of heat flow and of geothermal districts are summarized; the occurrence and distribution in the United States of the more than 1,300 thermal spring localities, indicative of geothermal districts, are reviewed. Future work will include broad regional studies in the Western United States, and detailed studies of one or more selected geothermal districts. Author (NSA)

N70-13396# Idaho Nuclear Corp., Idaho Falls. National Reactor Testing Station.

SUBASSEMBLY TEST PROGRAM OUTLINE FOR FY 1969 AND 1970

J. E. Grund, R. L. Johnson, K. O. Johnson, R. W. Miller, R. T. Johnson et al Aug. 1969 175 p refs
(Contract AT(10-1)-1230)
(IN-1313; IDO-17277) Avail: CFSTI

The subassembly test program in the Spert 4 capsule driver core for FY 1969 and 1970 is outlined. Basic program objective is to provide the AEC and reactor vendors with experimental information on reactor fuel behavior under transient overpower conditions. Test plans for unirradiated and irradiated (burnups to 30,000 MWd/T) UO₂ fuels, Pu recycle fuels, and LMFBF fuels are presented. Data of particular interest include failure modes and thresholds, conversion efficiencies of nuclear-to-mechanical energy, transient pressures, and metal-water reaction extents, all as functions of transient energy deposition for a variety of fuel design parameters, burnup, and environmental conditions. Author (NSA)

N70-14088# Lamar-Merifield, Santa Monica, Calif.

GEOLOGICAL INFORMATION FROM SPACE PHOTOGRAPHY

Paul M. Merifield *In Calif. Univ. Remote Sensing of the Environ.* Aug. 1968 27 p refs

Avail: CFSTI

The usefulness of high altitude photography in geologic studies is discussed, and several photographs and television images taken from above the atmosphere are analyzed to furnish an idea of the type of information recorded by them. Some aspects of satellite photogrammetry that are applicable to image interpretation are treated subsequently. The most complete coverage of the surface is in the form of TV pictures, but such photographs are less useful from a geologic standpoint owing to their lower resolution. One of the primary geological contributions of hyperaltitude photography is in identifying petroleum and mineral resources in unexplored or inadequately explored regions which are characterized not only by lack of geologic information but also of map and photographic coverage. It is emphasized that about 50% of the earth's surface is inadequately or completely unphotographed from the air, with most concentration being in North America and Europe. Satellite-borne cameras would yield photos with scales of about 1:2,000,000 to 1:250,000 from a 200-mile altitude; such small scale photos and maps made from them would be useful during the planning and reconnaissance stage of mineral and petroleum exploration. A.C.R.

N70-14123# Idaho Nuclear Corp., Idaho Falls. Reactor Engineering Branch.

CRITICAL FACILITIES

In its Reactor Eng. Branch Feb. 1969 p 115-147

Avail: CFSTI

Increasing reactor coolant temperature had only a small effect on shim and safety rod worths; however, the outer shim worths increased significantly when the experiment loop temperatures were raised. Measurements in typical ATR experiment irradiation positions show that fast neutron flux and gamma heating can be predicted from low power measurements in the ATRC within 5 and 20%, respectively. The power spectral density, from zero-power noise measurements, shows prominent resonances attributed to flow-induced vibrations of the in-pile experiment tubes. Power distribution measurements in the ATRC show that the core hot-spot power generation can be reduced 18% by using radially zone-loaded fuel elements, without affecting the fission rate in adjacent loop experiments. Author (NSA)

N70-14317# California Univ., Livermore. Lawrence Radiation Lab.

RADON DAUGHTER EQUILIBRIUM MEASUREMENTS IN URANIUM-MINE ATMOSPHERES

C. L. Lindeken *In its Hazards Control* Dec. 1968 p 34-38 refs Sponsored by AEC

Avail: CFSTI

When radon gas formed for radioactive decay of uranium escapes from exposed ore surfaces and enters the mine atmosphere, a series of short-lived daughter products is formed and becomes a potential hazard to mine workers. In an unventilated mine or in a section of the mine that is poorly ventilated, these daughter products will accumulate and will approach equilibrium with radon. Various methods for measuring radon daughter equilibrium are discussed. A prototype plutonium alpha air monitor using a 450 sq mm surface-barrier silicon diode is described for determining this radon daughter equilibrium. Author (NSA)

N70-15236# Gulf General Atomic, San Diego, Calif.

NEUTRON ACTIVATION ANALYSIS IDENTIFICATION OF THE SOURCE OF OIL POLLUTION OF WATERWAYS

V. P. Guinn and S. C. Bellanca *In Natl. Bur. of Std. Mod. Trends*

03 OTHER PRIMARY ENERGY SOURCES

in Activation Analysis, Vol. 1 Jun. 1969 p 93-97 refs

(Contract AT(04-3)-167)

Avail: SOD\$8.50

This paper is concerned with a method of determining the origin of a given pollution event in which fresh water, brackish water or sea water is polluted—accidentally or intentionally—by heavy oil (crude oil or heavy fuel oil). The method employed in this exploratory study was that of trace-element characterization via purely instrumental neutron activation analysis (NAA). In these exploratory measurements, 16 different marine fuel oils were analyzed by NAA, and their V, Mn, Na, Co, Sb, As, Cu, and Zn levels compared. The effects of prolonged contact with sea water and with fresh water upon these trace-element concentrations was also explored. The results indicated clearly the possibility of NAA trace-element characterization of oil-slick samples. Author

N70-16280# Institute of Nuclear Techniques, Krakow (Poland). **ON THE FEASIBILITY OF THE DETERMINATION OF WATER, SALT AND SULPHUR IN CRUDE OIL BY MEANS OF NEUTRON ACTIVATION ANALYSIS**

L. Gorski, J. Janczysyn, and L. Loska In Natl. Bur. of Std. Mod. Trends in Activation Analysis, Vol. 1 Jun. 1969 p 420-429. refs

(Contract IAEA-375/RB)

Avail: SOD\$8.50

Contaminations of crude oil can be determined by means of activation analysis with 14 MeV neutrons. The contents of the particular contaminants in crude oil imported by Poland are the following: NaCl contents: small—25 mg/liter, average—250 mg/liter; exceptionally high—1500 mg/liter; H₂O average—6 g/liter; S average—15 g/liter. Continuous determination of these contaminations can be carried out. Author

N70-15491*# New Mexico Univ., Albuquerque. Technology Application Center.

[ACTIVITIES OF TECHNOLOGY APPLICATION CENTERS]

Quarterly Status Report, Jul.—Sep. 1969

Sep. 1969 31 p

(Contract NSR-32-004-049)

(NASA-CR-107560) Avail: CFSTI CSCI 05B

User activity, marketing, and dissemination operations of the natural resources and industrial programs are summarized, along with the economic status and organizational changes at the information center. Steps were taken to provide quality photograph reproductions in reduced turn-around time. The EDN Caravan tour to publicize the technical utilization program is briefly discussed. J.A.M.

N70-16407*# Michigan Univ., Ann Arbor. Infrared and Optics Lab.

FURTHER INFRARED SYSTEMS STUDIES FOR THE EARTH RESOURCES PROGRAM Final Report

J. Braithwaite, L. Larsen, and E. Work Dec. 1969 77 p refs

(Contract NAS9-8381)

(NASA-CR-102111; WRL-2122-14-F) Avail: CFSTI CSCI 14B

This report discusses the development of design concepts and specifications for multispectral scanners for use from orbit as part of the Earth Resources Program. The performance of such scanners may be limited by component performance, by weight and power allocations, and by the data rates and bulks which can be returned to the ground. Some of the more critical of these factors have been examined in detail, and methods of dealing with them have been investigated. It is shown, for example, that a 7-channel scanner with a 200 ft ground resolution is feasible, but that the swath width would be limited to less than 20 miles unless telemetry bandwidths larger than those in current use are made available. Author

N70-16584# Akademiya Nauk URSR, Kiev.

THERMOPHYSICS AND THERMOENGINEERING: MINING THERMOPHYSICS

V. I. Tolubinskij ed. 1968 124 p refs In RUSSIAN

Avail: CFSTI

CONTENTS:

1. PRACTICAL APPLICATION OF UNDERGROUND HEAT SOURCES V. Ya. Zhuravlenko, A. A. Shurchkov, and E. R. Grosman p 7-14 refs

2. PROSPECTS FOR THERMAL WATER EXPLORATION IN TRANSCARPATHIAN REGION OF UKRAINIAN SSR I. A. Mesyets, B. A. Kotyk, and L. P. Myshkin p 15-18

3. RESULT OF GEOTHERMAL MEASUREMENTS IN DEEP BOREHOLES OF PETROLEUM-BEARING REGIONS OF THE UKRAINE A. A. Potushanskij p 19-24 refs

4. FILTRATION OF HEAT CARRIERS IN EARTH CORE ROCKS AT A DEPTH OF FROM 6 TO 8 KILOMETERS V. S. Gorbenko, V. P. Ponomarev, and A. I. Fialko p 25-30 refs

5. PRESSURE EFFECTS ON FILTRATION OF A HEAT CARRIER IN EARTH CORE ROCKS A. S. Tsyrlunikov and A. I. Fialko p 31-35 refs

6. CALCULATIONS ON BOILER APPARATUS FOR EXPLOITING SUB-SURFACE HEAT SOURCES A. V. Shurchkov p 36-40 refs

7. MINING THERMAL-PHYSICS IN SHAFTS AND PITS IN NORTHERN REGIONS Yu. D. Dyadkin (Leningrad Mining Inst.) p 41-51 refs

8. USING AIR CONDITIONERS TO REGULATE THE AIR TEMPERATURE AT THE FACE OF DEAD END MINES A. F. Voropaev, B. D. Chizhov, Yu. A. Novoselskij, A. D. Suslov, and Yu. D. Frolov p 52-58

9. HEAT TRANSFER IN FLOW PROCESSES FROM DEEP BOREHOLES Yu. P. Dobryanskiy, E. I. Baratov, and B. P. Chernyak p 59-65 refs

10. CALCULATING THE EFFECT OF HEAT TRANSFER ON AIR DISTRIBUTION IN A MINING NETWORK B. I. Medvedev (Donets Politechnical Inst.) p 66-72

11. CALCULATING THE INDEX OF ENDOGENIC INFLAMMABILITY ON THE BASIS OF HEAT TRANSFER AND THERMOCHEMICAL PROCESSES Kh. A. Bayev p 73-78 refs

12. CALCULATING EXPENDITURES FOR COOLING THE AIR IN A MINE SHAFT D. A. Karpov p 79-84 refs

13. THERMOGRADIENT MEASUREMENTS IN DEEP BOREHOLES A. N. Shcherban and N. I. Furman p 85-92 refs

14. REMOTE MEASUREMENT OF THE TEMPERATURE OF THE FLUSHING LIQUID DURING DRILLING OF DEEP WELLS N. I. Furman, V. P. Chernyak, N. S. Belogolovin, V. N. Tarasevich, and V. G. Grishko p 93-100 refs

15. IMPROVING THE PROCESS OF TREATING MERCURY ORES E. I. Baratov, E. N. Malashenko, and A. N. Shcherban p 101-108 refs

16. THE HEAT OF METHANE SORPTION BY COAL I. A. Ryzhenko p 109-114 refs

N70-16585# Akademiya Nauk URSR, Kiev.

PRACTICAL APPLICATION OF UNDERGROUND HEAT SOURCES

V. Ya. Zhuravlenko, A. V. Shurchkov, and E. R. Grosman In its Mining Thermophysics 1968 p 7-14 refs In RUSSIAN

Avail: CFSTI

Engineering and economic indicators are reviewed on the use of subsurface thermal waters in heat supply and power generating systems. An artificial circulation system is proposed for

03 OTHER PRIMARY ENERGY SOURCES

heat transfer from subsurface porous layers using underground boilers. Preliminary calculations for this system are given. E.C.

N70-16586# Akademiya Nauk URSR, Kiev.

PROSPECTS FOR THERMAL WATER EXPLORATION IN TRANSCARPATHIAN REGION OF UKRAINIAN SSR

I. A. Mesyets, B. A. Kotyk, and L. P. Myshkin *In its Mining Thermophysics* 1968 p 15-18 In RUSSIAN

Avail: CFSTI

Geothermal conditions and thermal water distribution resources within the Transcarpathian region are discussed. Sites most promising for thermal water prospecting operations are specified.

Transl. by E.C.

N70-16587# Akademiya Nauk URSR, Kiev. Ukrgeofizrazvedka Trust.

RESULT OF GEOTHERMAL MEASUREMENTS IN DEEP BOREHOLES OF PETROLEUM-BEARING REGIONS OF THE UKRAINE

A. A. Potushanskij *In its Mining Thermophysics* 1968 p 19-24 refs In RUSSIAN

Avail: CFSTI

Temperature measurements in deep boreholes are summarized. Temperatures higher than 100 C were recorded in ten boreholes. Predicted temperatures for rocks are given for depths up to 7000 meters. The potential of the petroleum-bearing regions of the Ukraine as a plentiful source of thermal energy is emphasized.

Transl. by E.C.

N70-16588# Akademiya Nauk URSR, Kiev.

FILTRATION OF HEAT CARRIERS IN EARTH CORE ROCKS AT A DEPTH OF FROM 6 TO 8 KILOMETERS

V. S. Gorbenko, V. P. Ponomarev, and A. I. Fialko *In its Mining Thermophysics* 1968 p 25-30 refs In RUSSIAN

Avail: CFSTI

Crack characteristics in rocks at depths of from 6 to 8 kilometers are examined. Results of theoretical and experimental investigations support the feasibility of constructing an 'underground boiler' system for generating thermal energy at these depths. A reliable filter system for heat conductors is also considered.

Transl. by E.C.

N70-16589# Akademiya Nauk URSR, Kiev.

PRESSURE EFFECTS ON FILTRATION OF A HEAT CARRIER IN EARTH CORE ROCKS

A. S. Tsyulnikov and A. I. Fialko *In its Mining Thermophysics* 1968 p 31-35 refs In RUSSIAN

Avail: CFSTI

Laboratory measurements of pressure effects on the permeability of rocks are reviewed. Results are given for comprehensive external pressure measurements on 8 sandstone-type and 4 close-grained metamorphized rocks with permeability levels of from 1.78 m-darcy to 20 darcy. Pressures ranged between 25 and 600 atm. A non-polar purified kerosene liquid filter was used. The porosity, density, and pore structure of the rocks was also determined. A formula is derived for calculating permeability variations in rocks due to applied pressure.

Transl. by E.C.

N70-16590# Akademiya Nauk URSR, Kiev.

CALCULATIONS ON BOILER APPARATUS FOR EXPLOITING SUB-SURFACE HEAT SOURCES

A. V. Shurchkov *In its Mining Thermophysics* 1968 p 36-40 refs In RUSSIAN

Avail: CFSTI

A formula is proposed for estimating optimized annual costs of a geothermal installation for exploiting underground heat sources. Parameters considered include the number of boreholes, their depth, and temperature drop measurements. Cost estimates for

mining operations would be calculated in terms of the annual output of thermal energy. Data on deductions from capital outlay for equipment, maintenance costs, and expenditures for the electrical energy to power the heat transfer circulation system would be included in the calculations.

Transl. by E.C.

N70-16595# Akademiya Nauk URSR, Kiev.

CALCULATING THE INDEX OF ENDOGENIC INFLAMMABILITY ON THE BASIS OF HEAT TRANSFER AND THERMOCHEMICAL PROCESSES

Kh. A. Bayev *In its Mining Thermophysics* 1968 p 73 78 refs In RUSSIAN

Avail: CFSTI

The inflammability of coal deposits can be calculated for warning of endogenic fires in coal mines. Fire hazards are usually evaluated by the tendency of coal to spontaneous combustion (chemical activity), which is related to the capacity of coal for oxidation and heat liberation. However, this evaluation often does not correspond to the actual fire hazard, because spontaneous combustion is a very complex process in which other factors, such as the size of the coal seam, air flow, conditions of heat transfer to the surrounding medium, etc., play a significant role in addition to chemical activity. Under certain conditions a combination of several factors causes spontaneous combustion of coal even with little chemical activity. Differential equations are derived for calculating some of these factors, and the heat transfer and thermochemical processes of spontaneous combustion of coal are considered.

Transl. by R.B.

N70-17649# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).

THE PRODUCTION OF NUCLEAR GRADE URANIUM DIOXIDE POWDERS FROM AUSTRALIAN ORES

P. G. Alfredson 19 Mar. 1969 19 p refs Conf. held at the Australian Inst. of Mining and Met., Sydney, 10-15 Aug. 1969 *Its Paper No. 3*

(CONF-690815-3) Avail: CFSTI

Power reactors using natural uranium dioxide fuel are of special interest to countries such as Australia that have their own uranium supplies. A wide range of uranium dioxide powders can be fabricated and the ideal one flows readily, presses without the need for binders or lubricants, sinters to the required density, and gives low reject rates at all fabrication stages. Details are given of the dissolution, solvent extraction, precipitation, filtration, drying, and calcination-reduction steps. Solvent extraction from sulphate media is also under study with a view to developing a process to produce a nuclear grade product at the mine treatment plant site.

Author (NSA)

N70-19219# Atomic Energy Commission, Washington, D.C. Div. of Reactor Development and Technology.

USE OF THORIUM IN NUCLEAR POWER REACTORS

Jun. 1969 144 p refs

(WASH-1097) Avail: SOD \$1.25

A review of the potential use of Th in power reactors is presented. Different reactor types are analyzed for Th fuel cycles. Characteristics of Th fuel cycles are described. Cost factors and long-range fuel demands and requirements are analyzed for power reactors. Design parameters for a conceptual 1000 MW(e) molten salt breeder reactor are presented.

NSA

N70-19586# Argonne National Lab., Ill.

CHEMICAL ENGINEERING DIVISION Annual Report, 1968

Apr. 1969 180 p refs

(Contract W-31-109-eng-38)

(ANL-7575) Avail: CFSTI

Experimental studies in nuclear chemistry and thermochemistry for the improvement of reactor fuels are presented. The areas

covered include: fluidization and volatility process, energy conversion, determination of burnup of fast reactor fuels, materials chemistry and thermodynamics, compact pyrochemical processes, reactor safety, and nuclear constants. J.M.C.

N70-20121 National Lending Library for Science and Technology, Boston Spa (England).

THE URANIUM/THORIUM CYCLE PROGRAMME

22 Oct. 1969 7 p Transl. into ENGLISH from Comit. Naz. Energia Nucl. Notiziario (Rome), May 1968 p 64-67

(NLL-RISLEY-Trans-1783-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The plans to investigate the technical and economic possibilities of the U/Th cycle and to study the technology in reprocessing irradiated fuel and fuel element refabrication are briefly described. The fissile material recovered from the reprocessing of the second third of the Elk River core will be used to make driver charge elements of the Halden heavy water reactor. The possibility of reprocessing fuel elements from a prototype HTR reactor is mentioned, and the costs of the program are tabulated. N.E.N.

N70-20349 National Lending Library for Science and Technology, Boston Spa (England).

LEAK TESTING OF CONTAINERS AND CAPSULES FOR RADIO-ACTIVE MATERIALS

H. Kowalewsky et al 17 Dec. 1969 8 p Transl. into ENGLISH from Material Pruefung: (Duesseldorf), v. 11, no. 10, 1969 p 345-347

(NLL-RISLEY-Trans-1865-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

Safety regulations governing the transportation of radioactive materials are discussed along with special leakage tests for packages and capsules for high activity materials and nuclear fuels. Pressure rise, helium leak, and radioactive dip tests are described and compared for efficiency in the determination of possible leaks. Results indicate that the helium leak test is by far the most accurate process. J.M.C.

N70-20596 National Lending Library for Science and Technology, Boston Spa (England).

CONTINUOUS TESTING IN THE MARCOULE PLANT

J. Chabert et al [1969] 6 p Transl. into ENGLISH from Bull. d'Inform. Sci. et Tech. (France), no. 140, Sep. 1969 p 23-26

(NLL-RISLEY-Trans-1866-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 1 NLL photocopy coupons

The continuous testing system of Marcoule chemical plant for irradiated fuel treatment is reviewed emphasizing the advantages of economy, safety, and regulation. Classical continuous testing of temperature, density, flow rate, and pH is evaluated, along with radio chemical measurements including alpha particles, gamma emission, and neutron irradiation. J.A.M.

N70-20779 National Lending Library for Science and Technology, Boston Spa (England).

NEW ABSORBENTS AND CLASSIFICATION OF METHODS OF REMOVING SULPHUR DIOXIDE FROM INDUSTRIAL GASES [NOVYE POGLOTITELI I KLASSIFIKATSIYA SPOSOBOV OCHISTKI PROMYSHLENNYKH GAZOV OT DYuOKISI SERA]

A. M. Nagiev et al Nov. 1969 5 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Neft. i Gaz. (USSR), no. 11, 1968 p 108-110

(NRL-RTS-5464) Avail: Natl. Lending Library, Boston Spa, Engl.: 7s 6d or 1 NLL photocopy coupons

Liquid petroleum products were investigated for their ability to absorb sulfur dioxide. Experiments show that sulfur dioxide is absorbed as a result of chemical reaction with hydrocarbon

compounds. Petroleum products which absorb sulfur dioxide become much lighter in color and different products have different absorption capacities. Classification methods are given for ways of extracting sulfur dioxide from waste gases. R.B.

N70-21010# Kyoto Univ. (Japan). Research Reactor Inst.

RESEARCH ON RADIOACTIVE DUST IN THE AIR AT KUR OPERATION

Akihiko Negoro, Koichi Sekiya, Tsujimoto Hiroto, Yoshi Tadashi, Giichi Yoshii et al [1968] 6 p refs In JAPANESE; ENGLISH summary

(KURRI-TR-56) Avail: AEC Depository Libraries

Investigations were carried out on the radioactive dust which might have been produced when KUR reactor operated. According to the results, the radioactive dusts produced in the course of operation of the KUR reactor may be divided into two kinds: the dust that may be originated from the fission production of the fuel; and the other, being the aerosols activated. The former, compared with the latter, is produced in greater quantity. Moreover, such a quantity appears to depend largely on the specific kind of fuel used and the time length of operation. Author (NSA)

N70-21080 National Lending Library for Science and Technology, Boston Spa (England).

DEVELOPMENT OF OXIDE SYSTEM FUELS

Yasuji Nakamura 17 Dec. 1969 22 p Transl. into ENGLISH from Genshi Ryoku Kogyo (Tokyo), v. 14, no. 8, 1968 p 19-24

(NLL-DOURREAY-TRANS-419-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

The development of fast reactor mixed oxide fuels for use in Japan is reviewed, and the power output, and high temperatures of the fast reactor cores are discussed. It is shown that an overall heat generation of from 500 to 700 kw per 12 of reactor core occurs. The research and development accomplished since the work started are reported in the following areas: (1) requirements in development of manufacturing techniques, (2) manufacturing processes, (3) costs, (4) assembly design and erection, and (5) irradiation tests. A table comparing the manufacture of PuO₂-UO₂ pellet fuels by the co-precipitation method to the mechanical mixing method is included. F.O.S.

N70-21251# Sandia Corp., Albuquerque, N. Mex.

TRANSIT ANALYSIS

J. R. Holland, C. J. M. Northrup, Jr., W. A. Stark, and D. C. Williams Oct. 1969 35 p refs

(SC-RR-69-662) Avail: CFSTI

The helium release from Pu(238)O₂ microsphere fuel was calculated for six different heat-sources that have been proposed for the transit radioisotope thermoelectric generator. The release mechanism was assumed to be classified diffusion, with a two-term, temperature-dependent diffusion coefficient. The temperature history assumed was based upon contractor-supplied information. Two different methods of approach were used and the results were compared. Helium release was calculated both for the normal mission profile and for various possible aborts. Upper and lower limits for the release were also calculated. The origins and nature of the rather sizable uncertainties involved are discussed. Author (NSA)

N70-21969# Societa Ricerche Impianti Nucleari, Saluggia (Italy). **PRESENT STATUS OF INVESTIGATIONS ON THE HEAT TRANSFER PROBLEMS OF THE EARTH BURIAL OF SPACE RADIOISOTOPE HEAT SOURCES**

A. Campanile Sep. 1969 23 p refs (Contract CNEN-ELDO/CTR/17/6/17)

(SORIN-T/601) Avail: CFSTI

This report deals with the problem of intact reentry of space radioisotope heat sources. The first impact phase is specially treated, with specific reference to land impact and heat dissipation problems under burial conditions. ESRO

03 OTHER PRIMARY ENERGY SOURCES

N70-23046# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PETROLEUM PRODUCTS, PROPERTIES, QUALITY, APPLICATION, PART 1 APPLICATION, PART 2

B. V. Losikov 22 Aug. 1969 236 p refs Transl. into ENGLISH from the Russian Report

(AD-698440; FTD-HT-23-347-68-Pt-1) Avail: CFSTI CSCL 21/4

The handbook presents data concerning the properties, quality, and application of petroleum products: liquid fuels and oils, lubricants, paraffin, bitumen, special oils, solvents, etc. Each chapter includes tables and diagrams of a particular products properties, conditions for use, and efficiency. The first section contains chapter 1-3 which cover: Fuels for spark-ignition piston engines; Fuels for air-breathing reaction (jet) engines; and Diesel fuels. TAB

N70-23047# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PETROLEUM PRODUCTS, PROPERTIES, QUALITY, APPLICATION, PART 1 APPLICATION, PART 2

B. V. Losikov 22 Aug. 1969 232 p refs Transl. into ENGLISH from the Russian Report

(AD-698546; FTD-HT-23-347-68-Pt-2) Avail: CFSTI CSCL 21/4

The document contains Chapters 4-6 of a Russian handbook of petroleum products. These chapters discuss fuel additives (antiknock, storage, corrosion), motor oils, and boiler fuels. TAB

N70-23048# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PETROLEUM PRODUCTS, PROPERTIES, QUALITY, APPLICATION, PART 3

B. V. Losikov 22 Aug. 1969 200 p refs Transl. into ENGLISH from the Russian Report

(AD-698547; FTD-HT-23-347-68-Pt-3) Avail: CFSTI CSCL 11/8

The document contains Chapters 7-10 of a Russian handbook of petroleum products. These chapters discuss drive-train oils, lubricating oils for aviation gas-turbine engines, industrial oils, and insulating oils. TAB

N70-23049# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PETROLEUM PRODUCTS, PROPERTIES, QUALITY, APPLICATION, PART 4

B. V. Losikov 22 Aug. 1969 237 p refs Transl. into ENGLISH from the Russian Report

(AD-698548; FTD-HT-23-347-68-Pt-4) Avail: CFSTI CSCL 11/8

The document contains Chapters 11 and 12 of a Russian handbook of petroleum products. These chapters discuss oil additives (viscosity, antioxidants, anticorrosion, detergents, antifoams) and lubricants. TAB

N70-24796# Joint Publications Research Service, Washington, D.C.

TERRESTRIAL GEOPHYSICS

In its Soviet-Bloc Res. in Geophys., Astronomy, and Space, No. 221 2 Feb. 1970 refs p 74-90 (See N70-24792 11-34)

Avail: CFSTI

The oil drilling rig at Shevchenkovo, a seven kilometer exploratory well, is described. Abstracts on a wide spectrum of geophysical data are included. J.A.M.

N70-25326 West Virginia Univ., Morgantown.

INFLUENCE OF ULTRASONIC ENERGY UPON THE RATE OF FLOW OF LIQUIDS THROUGH POROUS MEDIA

Wong-I Chen (Ph.D. Thesis) 1969 141 p

Avail: Univ. Microfilms: HC \$6.80/Microfilm \$3.00 Order No. 69-20702

The effects of ultrasonic energy upon the flow rate of crude

oil through porous sandstone and the effect of water flow through a porous stainless steel filter were investigated. When acoustic energy with a frequency of 20,000 cycles per second was introduced, there was a substantial increase in the rate of liquid flow through both of the porous mediums tested. The investigation made use of an oil bearing sandstone which had a porosity of 20 per cent with a pore diameter of approximately 25 microns. In the first series of runs, three thicknesses of sandstone were used 0.5, 1.0 and 2.0 centimeter. These runs were conducted at atmospheric pressure. A second series of runs were made placing the whole system under pressure. Pressures up to 80 psig were used. For the runs made at atmospheric pressure, the addition of ultrasonic energy increased the oil flow rate approximately two to nine times depending upon the thickness of the sandstone used.

Dissert. Abstr.

N70-28685# Bureau of Mines, Bartlesville, Okla.
COMPARATIVE EMISSIONS FROM SOME LEADED AND PROTOTYPE LEAD-FREE AUTOMOBILE FUELS

B. H. Eccleston and R. W. Hurn May 1970 28 p refs

(BMRI-7390) Avail: CFSTI

The effect upon automobile emissions in changing from leaded to lead-free gasolines was studied. Typical U.S. leaded gasolines and prototype lead free gasolines of comparable octane quality were used in eight vehicles operated to simulate city driving. The experiments were run at 70 and 95 F. Exhaust and evaporative emissions were measured and the photochemical effect of the emissions was experimentally observed in an artificial smog chamber. Results reveal the manner and degree in which the changes in fuel composition alter the amount and characteristics of both exhaust and evaporative emissions. It is shown that the compositional differences between leaded and prototype lead free fuels resulted in higher photochemical pollution potential of the emissions from the lead free fuels. The effect is attributed to the photochemical characteristics of high octane fuel components that are used in greater quantity in the lead free fuels. Author

N70-28899# California Univ., Lawrence Radiation Lab.

MIRROR SYSTEMS; FUEL CYCLES, LOSS REDUCTION, AND ENERGY RECOVERY

R. F. Post 8 Sep. 1969 51 p refs Presented at the Intern. Conf. on Nucl. Fusion Reactors, Culham, England, 17-19 Sep. 1969 Supported by AEC

(UCRL-71753; Conf-690901-7) Avail: CFSTI

The problem of maximizing the usable fusion energy from mirror-confined plasmas is considered. Two approaches are emphasized, as follows: (1) optimization of the fusion energy release by adjustment of the fuel plasma composition, ion temperature and operating cycle, together with exploitation of neutron-multiplying reactions in the blanket, and (2) employment of direct energy recovery techniques to improve injection efficiency and to recover energy in electrical form from the end loss particle flux. Approach (1) using DT reactions, followed by neutron multiplication and capture in sodium or aluminum is predicted to lead to steady state energy releases of about 30 to 35 MeV per reaction, depending on the tritium breeding ratio is required. With a modified DD cycle, where breeding is not required, total energy releases of about 15 MeV per deuteron should be obtainable by a similar technique. Author (NSA)

N70-29067# Steinkohlen-Elektrizitaet AG, Essen (West Germany).

WATER-SUSPENDED COAL SUPPLY TO THERMAL POWER PLANTS [VERSORGUNG THERMISCHER KRAFTWERKE MIT STEINKOEHLE/WASSER-SUSPENSION UEBER ROHRLEITUNGEN]

Heinrich Merten (Ph.D. Thesis—Tech. Hochschule, Darmstadt, West Ger.) Darmstadt, West Ger. Tech. Hochschule 4 Jul. 1969 110 p refs In GERMAN

Avail: CFSTI*

Measurements were made of the frictional pressure losses in four horizontal pipelines of different diameters, transporting coal/water suspensions in a wet grinding installation. It was concluded that deposit-free pipeline transport was only possible over longer periods in the turbulent flow range. Author (ESRO)

N70-33032# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).

NUCLEAR FUEL AND MATERIALS (U, BE, ZR) FOR REACTOR

Yoshitsuga Mishima Feb. 1970 17 p Transl. into ENGLISH from Kogyo Reamataru (Tokyo), no. 39, Sep. 1968 p 19-22 In ENGLISH and JAPANESE

(LIB/TRANS-240) Avail: AEC Depository Libraries

In the power generation program made public in January 1968 it was announced that the Japanese nuclear power installation would be generating 6.93 million kW by the end of 1975. Uranium ore was secured as much as 58% of the necessary amount up to 1978. The supply of U for the Tokai power station and the reproduction of used fuel were guaranteed by Great Britain; and the private ownership of nuclear fuel, the enriching service of 161 tons of U, and the procurement of 365 kg of Pu for research and development were guaranteed by the U.S.A. In order to prepare for the start of operation of nuclear power plants, standards relating to the transporting vessel for nuclear fuel and the criteria for inspections were drawn up. The qualitative problems of domestically produced fuel for the light water reactors were almost solved. The prototype conversion reactor with 200,000 kW output was scheduled to reach criticality in 1974. The fast breeder reactor fuel were to be produced in Japan. A decline of ductility in a beryllium alloy sheath tube due to helium damage was analyzed. A 901 kg rectangular bar of Be was used for the reflector in the material testing reactor JMIR. Author (NSA)

N70-34002# Mc Donnell-Douglas Co., Long Beach, Calif. ECONOMIC ANALYSIS OF THE USE OF GELLED FUELS INJET TRANSPORT AIRCRAFT Final Report

H. D. Whallon, A. T. Peacock, and L. D. Christensen Jul. 1970 64 p refs

(Contract FA-68-NF-273)

(FAA-NA-70-45; FAA-DS-70-13) Avail: CFSTI

A previous study examined the technical aspects of using gelled or emulsified fuel in a DC-8-62 commercial jet transport and identified associated problems. This study examined the economics of jet fleet conversion to the use of 2 percent gelled fuel. Based on the technical findings, a DC-8-62 analysis, it was estimated that conversion and operation for the ten years 1972-81 of all U.S. air carrier jet passenger airplanes would add about four billion dollars to their operating costs for the decade. This is approximately a 4.5 percent increase to total operating costs. Author

N70-35477# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MOSCOW. ALL-UNION SCIENTIFIC RESEARCH INSTITUTE FOR PETROLEUM REFINING. TRANSACTIONS

1 Oct. 1969 114 p refs Transl. into ENGLISH from Tr. Vses. Nauch.-Issled. Inst. po Pererabotke Nefti (Moscow), no. 10, 1967 p 154 159, 163 205, and 299 332

(AD-700689; FTD-HT-23-277-69) Avail: CFSTI CSCL 11/8

Contents: Potentiometric method for determining base numbers of additives and oils containing additives; Radio indicator method for studying detergent and antioxidant properties of engine oil additives; Method of studying sizes and charges of particles formed by detergent additives in motor oils; Method for thermographic examination of lubricating oil antiseizing additive stability and reactions with metals; Radio indicator method for examining the chemical activity of antiseizing additives at 200 - 600C in the oil-metal contact zone; Radio indicator method of examining the

reaction mechanism of organomolybdenum oil additives; Application of solid lubricant material to friction surfaces; Apparatus and method for comparative evaluation of wear on solid lubricant surfaces; Evaluation of wearability and antifriction properties of solid lubricant coatings on the MI machine; Evaluation of the stability of oils and greases in the rolling friction zone; and Apparatus for determining high-temperature grease drop-forming temperatures. TAB

N70-37284# United Kingdom Atomic Energy Authority, Risley (England). Reactor Group.

HIGH-TEMPERATURE REACTOR

N. H. Mc Laren Apr. 1970 15 p refs

(TRG-Rept-1996) Avail: AEC Depository Libraries

In the U. K. the helium cooled high temperature reactor is known as the Mark III GCR, Mark I and II being the Magnox and AGR designs, respectively. The development of the reactor engineering and of the fuel is described. A description of a typical Mark III reactor design is given. NSA

N70-37298# Universidad Nacional Autonoma de Mexico, Villa Obregon. Facultad de Quimica.

ENRICHMENT OF URANIUM BY THERMAL DIFFUSION

Concepcion Morales Cruz 1969 61 p refs In SPANISH

(NP-18173) Avail: AEC Depository Libraries

A design for the enrichment of uranium by thermal diffusion is proposed. The design indicates the most convenient equipment and the subsequent operational problems for the enrichment of natural uranium (0.7% of U-235) up to 2.1% U-235. The theoretical results indicate that the operation in principle is simple, and the equipment requirements are very simple and can be easily fabricated in any institution or laboratory of limited resources. The installation is easy and does not require much horizontal space, only a space with sufficient height. For the thermal diffusion design, the temperatures, wire, and the tube were 298 K for the primary and 1073 K for the secondary loops. The electrical power necessary is 1.675 kW. The calculated cost was \$8.55/g of UO2. Construction of the thermal columns derived from the theory is under way. NSA

N70-38878# Battelle Inst., Frankfurt am Main (West Germany).

THE IMPORTANCE OF UNCONVENTIONAL METHODS OF ENERGY CONVERSION FOR DEVELOPING COUNTRIES

Klaus Altfelder In its Battelle Inform. No. 1 Mar. 1968 p 22-23

Avail: CFSTI

This report discusses the use of nuclear, solar, wind and geothermal power for generating electric power in the 50-1000 kW range in developing countries. ESRO

N70-39139# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.

REPROCESSING OF IRRADIATED PLUTONIUM AND URANIUM MIXED OXIDES [LE TRAITEMENT DES OXYDES MIXTES DE PLUTONIUM ET D'URANIUM IRRADEES]

P. Faugeras 1969 34 p refs In FRENCH Presented at the 2d Spanish-French Symp. on Fuel Reprocessing and Plutonium Chem., Madrid, Nov. 1969

(CEA-Conf-1534; Conf-691122-3) Avail: AEC Depository Libraries

A study was made on the cost of reprocessing as a function of capacity for the irradiated mixed oxides UO2-PuO2. An amortization rate of 11% corresponding to a period of 17 years and to a rate of interest of 8% was considered. Several possible improvements to be made on the Purex process in order to reduce the reprocessing cost were studied. These are continuous shearing and dissolution; reduction in the number of extraction cycles for the separations of U from Pu; simplification of the conditioning

03 OTHER PRIMARY ENERGY SOURCES

operations of U and Pu; automation and automatic chemical control, and rational treatment of fission product solutions. The use of a volatilization process should reduce the cost of processing. Small plant units associated with one or several reactors on the same site seem to be still profit-making, because of the elimination of transfer and the reduction of plutonium investment.

Author (NSA)

N70-39255# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).

SEPARATION NOZZLE DEMONSTRATION PLANT FOR URANIUM ENRICHMENT

E. W. Becker et al [1969] 8 p refs Transl. into ENGLISH from Atomwirtsch., Atomtech. (Duesseldorf), v. 14, May 1969 p 249-251

(NP-TR-1884) Avail: AEC Depository Libraries

In order to make more accurate economic evaluations of the separation nozzle method, development and design studies were undertaken for a pilot plant with a separation output of 600,000 kg U/yr. The plant would supply light water reactors with a total capacity of 6000 MW(e) continuously with fuel. It would cost approximately 300 million DM and consume about 10% of the current produced. It was calculated that the investment costs and the current consumption could be reduced significantly by additional development work. A prototype of the nozzle stages proposed for the pilot plant is under construction. NSA

N70-39314# General Motors Desert Proving Ground, Mesa, Ariz. TOWARD A CLEANER ENVIRONMENT

John E. Blough In Ariz. Univ. Proc. of Air Pollution Control Seminar 13 Feb. 1970 p 4-11

Avail: NTIS

Progress is reported on efforts to eliminate the automobile as a cause of smog, with examples in the Los Angeles area. It is stated that emission controls on new cars are substantially reducing hydrocarbon output. Potential gains which may be realized from reductions in gasoline volatility, removal of tetraethyl lead from automobile gasoline, engine maintenance, and crankcase control devices are suggested. Research and development efforts to reduce carbon monoxide and nitrogen oxide emissions are mentioned.

P.A.B.

N70-39640# Labofina Societe Anonyme, Brussels (Belgium). FUELS FOR SUPERSONIC AIRCRAFT [LES COMBUSTIBLES POUR AVIONS SUPERSONIQUE]

Thierry de Menten de Horne In AGARD Fuels, Lubricants, and Auxiliary Fluids for Supersonic and Hypersonic Aviation Jun. 1970 p 29-50 refs In FRENCH

Avail: NTIS

Estimates of fuel consumption in commercial aviation are considered for the years 1960 to 1985. The technical requirements of a fuel are examined, including caloric power provided, weak volatility, thermal stability, combustion characteristics, and behavior at low temperature. The use of additives to correct fuel faults is discussed with relation to the formation of static electricity, fuel stability during storage, microorganism activity in turbine fuels and resulting corrosion, and additives modifying the flow properties of kerosenes. Other solutions proposed for supersonic and hypersonic flights are mentioned, including cryogenic fuels and fuels derived from boron.

Transl. by P.A.B.

N70-40779# Federal Aviation Administration, Washington, D.C. Aircraft Development Service.

PROPULSION FUEL SYSTEM FIRE SAFETY

Thomas G. Horeff In its Res. and Develop. Rept. to Ind. Jun. 1969 10 p

Avail: NTIS

Research and development progress on aircraft propulsion fuel system fire safety and prevention is presented. Specifically discussed are: (1) tests of liquid nitrogen as a fire extinguishing agent; (2) flame propagation through aircraft vent systems; and (3) thickened safety fuels and fuel system compatibility. Also discussed is the amount of air pollution caused by aircraft and the limitations it may have on the growth of air transportation if precautions are not taken.

A.L.

N71-15083# Gulf General Atomic San Diego, Calif. DEVELOPMENT OF NUCLEAR ANALYTICAL TECHNIQUES FOR OIL SLICK IDENTIFICATION, PHASE 1

D. E. Bryan, V. P. Guinn, R. P. Hackleman, and H. R. Lukens 21 Jan. 1970 134 p refs

(Contract AT(04-3)-167)

(GA-9889) Avail: NTIS

Neutron activation analysis (NAA) has been found to quantitatively measure a large number of trace elements in crude oils and residual fuel oils. Examination of trace element concentrations in oils before and after exposure to wave action, elevated temperature, ultraviolet light, and bacteriological attack demonstrates that the large majority of these concentrations were only slightly affected by a minimal exposure, after which they were stable toward further exposure. Each trace element concentration represents an evidence point for comparison of oil samples, and it was found that there were more than enough stable evidence points determinable by NAA to distinguish between each of 40 different oil samples. Determination of S-34/S-32 of oil specimens reveals that this ratio is another useful evidence point.

Author (NSA)

N71-19770# Systems Research Corp., Washington, D.C. NAVAL SURFACE SHIP ARCTIC MISSIONS. VOLUME 2. APPENDIX A: ARCTIC RESOURCES

L. C. Van Allen, D. M. Tyree, and G. S. Sexton 18 Dec. 1970 128 p refs

(Contract N00014-70-C-0323)

(AD-716415: SRC-70-TR-N3001-Vol-2-App-A) Avail: NTIS CSCL 8/7

Contents: U.S. Arctic resources; (Population, industries, fuel, coal, petroleum, transportation); Canadian Arctic resources; (Population, natural resources, industries, transportation); U.S.S.R. Arctic resources; (Population, industries, fuel, transportation); Scandinavian Arctic resources; and Greenland Arctic resources.

GRA

N71-20533*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

CONVERSION OF AN EXPERIMENTAL TURBOJET COMBUSTOR FROM ASTM A-1 FUEL NATURAL GAS FUEL

Francis M. Humenik Washington Mar. 1971 33 p refs

(NASA-TM-X-2241; E-6031) Avail: NTIS CSCL 20M

A side-entry turbojet combustor previously developed with ASTM A-1 fuel was redesigned to use natural gas fuel. The rectangular test section simulated a segment of an annular turbojet combustor. Five combustor liner configurations and two fuel nozzle geometries were evaluated. Natural gas fuel temperatures ranging from -259 to 1200 F were investigated. The test conditions were as follows: nominally atmospheric inlet pressure; inlet air temperature to 600 F; and diffuser inlet Mach numbers of 0.24, 0.30, and 0.37 corresponding to nominal reference velocities of 77, 100, and 120 ft/sec, respectively. The combustor configurations were designed to achieve combustor exit temperatures combustion efficiency and desirable radial exit-temperature profiles having low pattern factors were achieved with only minor combustor modifications. Ignition was readily obtained with natural gas temperatures of -235 F.

Author

N71-21050# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

FACTORS AFFECTING THE OPTIMUM FUEL CYCLE

D. E. Deonigi and E. T. Merrill Oct. 1970 14 p Presented at the Regional Meeting of the AIChE, Richland, Wash., 23 Oct. 1970 (Contract AT(45-1)-1830)
(BNWL-SA-3605; CONF-701022-1) Avail: NTIS

Some of the fuel cycle codes which use different techniques for fuel cycle cost calculations are examined. A comparison of the codes shows that the figures used for working capital are responsible for the only variations in the calculated costs. It is shown that a theoretically optimum fuel cycle can be calculated simply by determining the fuel cycle cost resulting from fuel operating to a given exposure without regard to control requirements and system load factors. NSA

N71-21304* Coast Guard, Washington, D.C. Applied Technology Div.

RESULTS OF OVERFLIGHTS OF CHEVRON OIL SPILL IN GULF OF MEXICO Final Report

Clarence E. Catoe 24 Aug. 1970 20 p refs Sponsored by NASA Original Contains Color Illustrations
(NASA-CR-117497; AD-714681) Avail: NTIS CSCL 14/5

The NASA 927, Earth Resources Aircraft, at Coast Guard request, flew over the Chevron Oil Spill on 16 March 1970, during the day and night. The aircraft was equipped with photographic, infrared, and radar type systems, which collected the data in the oil spill area. Ground truth data during these overflights was collected by Coast Guard personnel and a team of oceanographers from Louisiana State University. The initial data received from NASA, Manned Spacecraft Center was restricted to photographic and 8 to 14 micrometer scanner data. The preliminary analysis of the test results obtained is limited to the above mentioned applicable sensors. Author (GRA)

N71-22717# National Bureau of Standards, Boulder, Colo. Cryogenics Div.

SURVEY OF CURRENT INFORMATION ON LNG AND METHANE AND MEASUREMENTS OF THE THERMOPHYSICAL PROPERTIES OF COMPRESSED FLUID METHANE Annual Progress Report

1 Feb. 1971 91 p refs Sponsored by Am. Gas Assoc., Inc.
(NBS-9781; APR-1; U-204) Avail: Issuing Activity

Research reported includes: (1) a brief summary of the results of a literature survey on liquefied natural gas and methane; (2) a report on the Second International Conference on Liquefied Natural Gas; and (3) a description and summary of studies on the thermophysical properties of compressed fluid methane. Two published research papers on the thermophysical properties studies are presented, along with a manuscript on the preliminary computation of thermodynamic properties of methane. D.L.G.

N71-23499* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. DECONTAMINATION OF PETROLEUM PRODUCTS Patent

James R. Mosier, inventor (to NASA) Issued 16 Jul. 1968 (Filed 18 May 1965) 2 p Cl. 44-77 Sponsored by NASA

(NASA-Case-XNP-03835; US-Patent-3,393,059;

US-Patent-Appl-SN-456874) Avail: US Patent Office CSCL 07C

A description is given of a means and method of effectively controlling bacteria growth in petroleum products, as well as trapping other impurities such as water and solid particles which normally settle to the bottom of stored petroleum products, by the use of a small effective amount of honey.

Official Gazette of the U.S. Patent Office

N71-28159* Techtran Corp., Glen Burnie, Md.
REFORMING OF GASEOUS HYDROCARBONS INTO TOWN GAS [OMZETTING VAN KOOLWATERSTOFFEN IN STADSGAS]

Jaap Van Willigen (Ph.D. Thesis Technisch Hogeschool, Delft (Netherlands) Washington NASA Jun. 1971 140 p refs Transl. into ENGLISH from Dutch report

(Contract NASw-2037)

(NASA + TT-F-13668) Avail: NTIS CSCL 13H

The reforming reaction of hydrocarbons with steam is a homogeneous gas phase reaction with an induction period that needs only a thin layer of catalyst to start the reaction. Accordingly, a mixture of hydrocarbons and steam heated to at least 600 C is passed through a thin layer of catalyst, during which passage the reforming starts whereupon the reaction is completed in the empty reactor chamber above the catalyst. The need for heat for the endothermic reaction may be met by external heating, but also by adding air or oxygen to the gas mixture. Author

N71-29603* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

PROCEEDINGS: SPACE TRANSPORTATION SYSTEM PROPULSION TECHNOLOGY CONFERENCE. VOLUME 3: AUXILIARY POWER UNIT AND AIRBREATHING PROPULSION

28 Apr. 1971 161 p Conf. Held at Huntsville, Ala. 6-7 Apr. 1971

Avail: NTIS CSCL 21H

CONTENTS:

1. AUXILIARY POWER UNIT: INTRODUCTION D. G. Beremand (NASA, Lewis Res. Center, Cleveland, Ohio) p 1097-1098

2. AUXILIARY POWER UNIT DESIGN STUDIES W. L. Burris and M. L. Hamilton (AirResearch Mfg. Co., Los Angeles, Calif.) p 1099-1122

3. AUXILIARY POWER UNIT DESIGN STUDIES R. S. Siegler (Rocketdyne, Canoga Park, Calif.) p 1123-1190

4. H2 FUEL SYSTEM INVESTIGATION W. Collier (GE, Philadelphia, Pa.) p 1191-1224

5. BOOSTER AND ORBITER ENGINE STUDIES H. G. Moore (Pratt and Whitney Aircraft, West Palm Beach, Fla.) p 1225-1255

N71-29852# Atomic Energy Commission, Washington, D.C.

ENERGY SOURCES OF TOMORROW

W. E. Johnson In its Proc. of the 11th AEC Air Cleaning Conf., Vol. 2 Dec. 1970 p 459-466

Avail: NTIS HC\$6.00/MF\$0.95

The energy required in the USA in the future to keep the environment habitable for an expanding population and the relation between our environment and energy are discussed. It is concluded that 6 times the present electric energy capacity will be needed by the year 2000 to clean the environment and to maintain a reasonable standard of living for the additional population. Methods must be found for producing, distributing, and both cleanly and economically using fossil fuels. The more efficient breeder reactors must be developed for the economic use of nuclear fuels in commercial power plants. Finally, a nationally coordinated system for planning, developing, constructing, financing, and operating power plants is needed to achieve both the future electric energy needs and the environmental compatibility requirements. NSA

N71-29878# Northeastern Radiological Health Lab., Winchester, Mass.

INVESTIGATION OF A NUCLEAR FUEL REPROCESSING PLANT UPON ITS ENVIRONMENT

D. G. Smith In AEC Proc. of the 11th AEC Air Cleaning Conf., Vol. 2 Dec. 1970 p 832-836

Avail: NTIS HC\$6.00/MF\$0.95

To prevent unnecessary expenditures on hastily conceived environmental sampling and monitoring programs around the several

03 OTHER PRIMARY ENERGY SOURCES

planned nuclear fuel reprocessing plants, a project for development of a recommended methodology to enable agencies to carry out their responsibilities economically and accurately with a minimum of cost or inconvenience to the operators of these facilities is suggested. The objectives of this study are: To develop minimum and optimum requirements for environmental surveillance programs around nuclear fuel reprocessing plants; to develop a uniform set of surveillance methods that can be adopted by other states and companies in meeting surveillance needs; to identify specific radionuclides that may be released in liquid and gaseous waste discharges and the pathways by which they are dispersed in the environment; and to relate the levels of released radionuclides to levels in critical pathways in order to specify the most beneficial sampling and analyses to perform. Author (NSA)

N71-30165# Committee on Interior and Insular Affairs (U.S. Senate).

FUELS AND ENERGY

Washington GPO 1970 262 p refs Hearings on S. 4092 before Comm. on Interior and Insular Affairs, 91st Congr., 2d Sess., 10-11 Sep. 1970

Avail: Subcomm. on Minerals, Mater., and Fuels

Public hearings on September 10-11, 1970 before the Senate Subcommittee on Minerals, Materials, and Fuels regarding a bill to establish a Commission on Fuels and Energy are reported. The purpose of such a commission is to recommend programs and policies to insure the U.S. requirements for low cost energy are met and to reconcile environmental quality requirements with future energy needs. A.C.R.

N71-30522# Royal Swedish Academy of Engineering Sciences, Stockholm.

NATURAL GAS: ENERGY SOURCE AND RAW MATERIAL [NATURGAS: ENERGIBÄRARE OCH RÄVARA]

1970 99 p In SWEDISH

(IVA-Medd-167) Avail: NTIS

The results of an analysis of energy sources available in Sweden show that natural gas must be considered as a supplementary raw material source. Cost and environmental problems are investigated taking advantage of experiences already gained in Russia, Europe, and North America. A possible link-up with existing natural gas networks in Russia or Europe and the use of natural gas on an inter-Scandinavian basis is considered. ESRO

N71-31466# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

USE OF AN AIR-ASSIST FUEL NOZZLE TO REDUCE EXHAUST EMISSIONS FROM A GAS TURBINE COMBUSTOR AT SIMULATED IDLE CONDITIONS

Daniel Briehl and Leonidas Papathakos Washington 1971 21 p refs

(NASA-TN-D-6404; E-6247) Avail: NTIS CSCL 21E

Tests were performed at typical engine idle conditions on a single J-57 combustor liner installed in a 30-cm-(12-in.-) diameter pipe to evaluate design modifications for reducing exhaust emissions. Using an air-assist fuel nozzle, the combustion efficiency was increased from 90.3 to 96.5 percent, and the total hydrocarbon and carbon monoxide exhaust emissions were reduced from 26.3 to 3.3 and from 51 to 40 g/kg of fuel burned, respectively. A corresponding increase in nitric oxide emissions from 0.8 to 1.5 g/kg of fuel burned was observed. Calculations performed for a complete landing-takeoff cycle of a typical engine indicated that the use of an air-assist nozzle during idle could decrease the total quantity of hydrocarbon and carbon monoxide emission by 69 and 20 percent, respectively, while nitric oxide would increase by 14 percent. The required secondary nozzle airflow amounts to less than 0.5 percent of the total engine airflow at idle. Author

N71-35178# Committee on Public Works (U. S. Senate).

OIL SLUDGE DUMPING OFF THE FLORIDA COAST

Washington GPO 1971 94 p refs Hearing before Comm. on Public Works, 91st Congr., 2d Sess., 7 Dec. 1970

Avail: Subcomm. on Air and Water Pollution

Statements and testimony presented to the Subcommittee regarding this major oil spill are documented. Included is a reprint of a report prepared by the Council on Environmental Quality on Ocean Dumping, A National Policy. J.G.M.

N71-35181# Committee on Interior and Insular Affairs (U. S. Senate).

NATIONAL FUELS AND ENERGY POLICY

Washington GPO 1971 133 p refs Hearing on S. Res. 45 before Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess., 25 Feb. 1971

Avail: Comm. on Interior and Insular Affairs

Congressional testimony concerning a study of the nation's energy resources and a review of the body of law and policy which influence the energy situation is presented. Examples of problems throughout the energy system which indicate the need for such an investigation are presented. Statements of law makers from various states are included to define the scope of the problem. PNF

N71-35501 National Lending Library for Science and Technology, Boston Spa (England).

PROGNOSIS OF THE WORLD ENERGY SUPPLY BETWEEN NOW AND THE YEAR 2000 WITH REFERENCE TO THE QUANTITY OF ENERGY RAW MATERIALS CONSUMED

Th. R. Seldenrath 12 Mar. 1971 23 p Transl. into ENGLISH from Chem. Weekbl. (Netherlands), v. 66, no. 44, 30 Oct. 1970 p 20-26

(NLL-Trans-1166-(9022.9)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A statistical assessment is presented of the nuclear energy, solid fuel, petroleum, natural gas, and water power energy resources in the year 2000. The analysis is based on current economic and technical trends in the world energy consumption and not on potential primary energy sources such as solar radiation or heat from the interior of the earth or potential advancements in reactor technology. J.G.M.

N71-35815# Oak Ridge National Lab., Tenn.

8r 90 HEAT SOURCES

Roberts Shor, (ed.), Robert H. Lafferty, Jr., (ed.), and P. S. Baker, (ed.) May 1971 134 p refs

(Contract W-7405-eng-26)

(ORNL-11C-36) Avail: NTIS

This includes purification, transportation, preparation of fuel forms, analytical methods, densification, encapsulation, source testing, and examination of used sources. Details of source preparation, encapsulation, and testing are given. Author (NSA)

N71-36393# Bureau of Mines, Washington, D.C.

REVIEW OF BUREAU OF MINES ENERGY PROGRAM, 1970

Bill Unville and John D. Spencer 1971 119 p refs

(BM-1C-8526) Avail: NTIS

A program of research to help U.S. industry meet the energy demands for fuels, electrical power, and chemicals during the 1970's is discussed. Subjects presented are: (1) solid waste utilization and disposal, (2) coal mine safety, (3) coal storage and shipment, (4) electric power generation from coal, (5) chemicals from coal carbonization, (6) fuels and chemicals by synthesis processes, (7) petroleum and natural gas production, and (8) oil shale utilization. Author

N71-36738# Argonne National Lab., Ill.

WORK PLAN FOR CONTINUATION OF THE PROJECT REDUCTION OF ATMOSPHERIC POLLUTION BY THE

APPLICATION OF FLUIDIZED BED COMBUSTION

A. A. Jonke, G. J. Vogel, L. J. Anastasia, and R. L. Jerry Apr. 1971 38 p refs
(Contract W-31-109-eng-38)
(ANL/ES-CEN-1003) Avail: NTIS

A development program is outlined for a continuing study of the lowering and control of the level of pollutants (SO₂, NO, and particulate) in flue gas from the combustion of fossil fuels, using the fluidized-beds to which limestone is added. The major emphasis of the next phase of work will be on combustion at pressures up to 10 atm and regeneration of the sulfated lime under pressure. Fluidized-bed combustors will be operated in the one- and two-stage modes to investigate effects on NO_x and sulfur emissions. The program will include laboratory- and bench-scale work aimed at elucidating mechanisms important to sulfur oxide and nitrogen oxide control. Author

N71-37701 National Lending Library for Science and Technology, Boston Spa (England).

THE RATE OF OXIDATION OF PETROLEUM PRODUCTS IN WATER WITHOUT ADDITION OF NITROGEN

A. I. Iz'yurova 22 Sep. 1971 9 p. Transl. into ENGLISH from Gig. Sanit. (USSR), no. 7, 1952 p 12-17
(NLL-NSTIC-Trans-2474-(6180.59)) Avail: Natl. Lending Library, Boston Spa, Engl.; 1 NLL photocopy coupon

The bacterial oxidation of petroleum products in water is discussed. In waters not containing nitrogen, phosphorus and potassium (N, P, K), oxidation of petroleum products did not occur. With sufficient quantities of the nutrients mentioned, bacterial oxidation of petroleum products proceeds very rapidly and the surface of the water, with a petroleum film of 2 mm in thickness is completely purified from this layer in 1-2 months. The process of oxidation of petroleum products can also occur without nitrogen, if phosphorus and potassium are present in the water. The nitrogen necessary for the process was apparently fixed from the air by bacteria. The process of the biological purification of water from petroleum products on the surface of the water, upon addition of all nutrients to the water and upon addition only of phosphorus and potassium was investigated. The petroleum product investigated was machine oil. Author

N72-10830# Mitre Corp., McLean, Va.

A SURVEY OF PROPULSION SYSTEMS FOR LOW EMISSION URBAN VEHICLES

W. E. Fraize and R. K. Lay Sep. 1970 116 p refs Sponsored by DOT
(Contract F19628-68-C-0365)
(PB-200144; UMTA-TRD-52-70-2; M70-45) Avail: NTIS CSCL 13F

An overview is presented of low and negligible emission urban vehicle technology. Propulsion systems suitable for low emission urban vehicles are described. The state-of-the-art of low emission systems is surveyed by direct contact with active development efforts in industry; the more promising areas for future development are reviewed. Exhaust emissions for fossil-fueled heat engines are summarized. A computer program was developed to demonstrate the effect of the various route cycle and vehicle parameters on required power and vehicle speed; results are presented for a typical small urban bus. Author (GRA)

N72-11676# Pisa Univ. (Italy). Lab. Prova Combustibili.

LOW EMISSION FUELS AND DEVICES FOR AVIATION ENGINES

G. Nardi In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 13 p refs (See N72-11668 02-27)
Avail: NTIS HC \$6.00/MF \$0.95

Reduction of harmful emissions of turbine engine exhaust system is reviewed. The type of fuel used, combustion chambers, and operating conditions of combustors are also investigated. Author

N72-11677# Lucas Gas Turbine Equipment, Ltd., Burnley (England).

FUEL RELATED PROBLEMS IN AIRCRAFT FUEL SYSTEMS

S. L. Forgham and R. G. Beckett In AGARD Aircraft Fuels, Lubricants, and Fire Safety Aug. 1971 14 p refs (See N72-11668 02-27)

Avail: NTIS HC \$6.00/MF \$0.95

Aircraft fuel problems are discussed, emphasizing problems associated with hydrogen treated fuels. Some of the problems were overcome by fuel system design modification, and other changes are reviewed which were instituted by refinery industries. Research on fuel sealing is also described. J.A.M.

N72-12262*# Aerojet-General Corp., El Monte, Calif. Microwave Div.

A STUDY OF PASSIVE MICROWAVE TECHNIQUES APPLIED TO GEOLOGIC PROBLEMS

A. T. Edgerton In NASA, Manned Spacecraft Center 3d Ann. Earth Resources Program Rev., vol. 1 1970 12 p

Avail: NTIS CSCL 08G

Passive microwave techniques were applied to geologic problems, in order to establish the microwave properties of representative rocks and minerals, and to examine the feasibility of using microwave radiometry for geologic mapping problems. A review of microwave pertaining to geology was conducted, coupled with laboratory and field investigations of the microwave emission characteristics of various geologic features. The laboratory studies consisted of dielectric constant measurements of rocks and minerals. A majority of field investigations conducted in the western United States, involved the microwave emission characteristics of rock types, and a portion of the study was concerned with microwave properties of mineralized areas. Experiments were also conducted in the vicinity of a coal seam fire in Colorado and across the San Andreas Fault Zone near the Salton Sea, in Southern California. Author

N72-12311*# Naval Research Lab., Washington, D.C.

RADAR MONITORING OF OIL POLLUTION

N. W. Guinard In NASA, Manned Spacecraft Center 3d Ann. Earth Resources Program Rev., Vol. 3 1970 1 p (See N72-12295 03-13)

Avail: NTIS HC \$6.00/MF \$0.95

Radar is currently used for detecting and monitoring oil slicks on the sea surface. The four-frequency radar system is used to acquire synthetic aperture imagery of the sea surface on which the oil slicks appear as a nonreflecting area on the surface surrounded by the usual sea return. The value of this technique was demonstrated, when the four-frequency radar system was used to image the oil spill of tanker which has wrecked. Imagery was acquired on both linear polarization (horizontal, vertical) for frequencies of 428, 1228, and 8910 megahertz. Vertical returns strongly indicated the presence of oil while horizontal returns failed to detect the slicks. Such a result is characteristic of the return from the sea and cannot presently be interpreted as characteristics of oil spills. Because an airborne imaging radar is capable of providing a wide-swath coverage under almost all weather conditions, it offers promise in the development of a pollution-monitoring system that can provide a coastal watch for oil slicks. Author

N72-12329*# Earth Satellite Corp., Washington, D.C.

REMOTE SENSING FOR MINED AREA RECLAMATION: APPLICATION INVENTORY

1 Jun. 1971 40 p ref Sponsored by NASA
(NASA-CR-124608; NASA-Task-160-75-73-04-10;
IR-USGS-218) Avail: NTIS CSCL 08G

Applications of aerial remote sensing to coal mined area reclamation are documented, and information concerning available data banks for coal producing areas in the east and midwest is given. A summary of mined area information requirements to which remote sensing methods might contribute is included. Author

N72-12617# Los Alamos Scientific Lab., N.Mex.

PO-238 SPACE ELECTRIC POWER FUEL DEVELOPMENT PROGRAM Quarterly Status Report, 1 Oct. - 31 Dec. 1970

03 OTHER PRIMARY ENERGY SOURCES

Jun. 1971 17 p
(Contract W-7405-eng-36)
(LA-4697) Avail: NTIS

Efforts during the report period were devoted mostly to development of PuO₂-Mo fuel disks. Development studies were initiated in support of heat sources using (Pu-238)O₂/ThO₂ fuels. Data used in characterization of PuO₂-Mo cermets are included.

NSA

N72-14402# Aerojet-General Corp., El Monte, Calif. Microwave Div.

MICROWAVE RADIOMETRIC DETECTION OF OIL SLICKS

Final Report, 12 Jun. 1970 - 28 Feb. 1971

D. C. Meeks, D. P. Williams, R. M. Wilcox, and A. T. Edgerton
Mar. 1971 103 p refs

(Contract DOT-CG-93228-A; USCG Proj. 714104/A/002)
(AD-728551, AGC-1335-2; FR-2) Avail: NTIS CSCL 13/2

Two years of research have been conducted to determine the feasibility of using microwave radiometry for the detection, identification, and surveillance of oil pollution. Theoretical studies consisted of a review of contemporary theory concerning parameters that influence microwave emission from both unpolluted and oil-covered seas. Laboratory investigations confirm results obtained from earlier studies and established the response characteristics of the 3.2-mm sensor to continuous oil films. Airborne measurements of controlled spills off the Southern California Coast were performed with dual-polarized 3.2- and 8.1-mm sensors oriented with a forward antenna viewing angle 45 deg above nadir. Four sets of oil spills, or missions, were performed to obtain data over a variety of sea-surface conditions. Pollutants used for the tests included No. 2 diesel fuel, 26.1 and 21.6 API gravity crude oils, and 9.7 API gravity fuel oil. Significant microwave brightness temperature oil slick signatures were noted for a wide range of ocean conditions (sea states 1-4) and oil film thickness (thickness + 1 micron and greater). Based on the experimental results a passive microwave imaging system configuration has been recommended for oil pollution surveillance.

Author (GRA)

N72-14478# Coast Guard, Washington, D.C. Applied Technology Div.

THE APPLICABILITY OF REMOTE SENSOR TECHNIQUES FOR OIL SLICK DETECTION

Clarence E. Catoe 25 Feb. 1971 29 p refs

(CG Proj. 714104)

(AD-728422; USCG-71404-(A)-009) Avail: NTIS CSCL 13/2

The applicability of remote sensing techniques to the detection of oil films on water is furnished. Short reviews of various imaging techniques and their feasibility as oil film detectors are provided. The results of Coast Guard sponsored research to develop characteristics signatures for sensors operating in the UV to microwave of the electromagnetic spectrum are given. Field test results of existing passive and active sensors obtained from oil spill overflights is presented.

Author (GRA)

N72-16196# Centre d'Etude de l'Energie Nucleaire, Mol (Belgium).

LARGE SCALE PRODUCTION OF Ac-227 AND DEVELOPMENT OF AN ISOTOPIC HEAT SOURCE FUELED WITH Ac203

L. H. Baetsle, P. Dejonghe, A. C. Demildt, M. J. Brabers (Louvain Univ., Belgium), A. DeTroyer (Union Miniere, Burssels, Belgium), A. Droissart, and M. Poskin (Union Miniere, Brussels, Belgium)
May 1971 16 p refs Presented at the 4th Intern. Conf. on the Peaceful Uses of Atomic Energy, Geneva, 8-16 Sep. 1971

(A/Conf-49/P/287; Conf-710901-106) Avail: AEC Depository Libraries

The irradiation devices and hot cell facilities including a radon absorption facility adapted for work with large quantities of Ra-226 and the resulting amounts of Ac-227 and Th-228 were completed and put into operation during the last quarter of 1969. The first irradiation took place in November 1969 and after several months of adaptation and improvement of the

installation, routine production has now been started. A production of the order of 20 to 30 g Ac-227 per year is possible in the existing facilities in the near future. A double containment, during irradiation in BR2, is ensured by putting the welded capsules in an aluminum rig (thimble) connected to a suitable instrumented control panel. Three hot cells were fitted out with chemical equipment for precipitation, ion exchange techniques, and handling of oxide powders. Three other hot cells are installed to fabricate and test the heat source. A prototype heat source of 30 Watts to test fuel and capsule behavior and the venting system is now in preparation.

Author (NSA)

N72-16934# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.

EFFECTIVE STACK HEIGHTS FOR TALL STACKS

Jeffery C. Weil and David P. Hoult Oct. 1971 46 p refs
(F03-AP-41-1105-02)

(FML-Publ-71-14) Avail: NTIS

A simple method is given to predict the effective stack height for a tall stack and the corresponding ground-level concentrations of the effluents emitted from the stack. The height of the convective mixing region of the atmosphere determines when the effluents are carried to the ground in downward moving air currents. A model to determine the scale of the mixing region is presented and verified with vertical temperature profile measurements. Previous theories on buoyant plume rise are used to determine the effective stack height. For a plume rising in a stable atmosphere the levelled-off height of the plume is shown to be the effective stack height. In a neutral atmosphere the effective stack height is given by the height where the plume rise velocity is equal to the vertical velocity scale in the mixing layer. A total of 760 measurements of the axial ground-level concentration of sulfur dioxide downwind of a 244 m stack are empirically correlated.

Author

N72-16981# RWE-Aktiengesellschaft, Essen (West Germany).

RESOURCES OF PRIMARY ENERGY

Heinrich Mandel 24 Feb. 1972 27 p refs Presented at 4th Intern. Conf. on The Peaceful Uses of Atomic Energy, Geneva, Switzerland, 6 Sep. 1971

(A/Conf-49/P/359; Conf-710901-123) Avail: AEC Depository Libraries

The fossil fuels should be sufficient for about 460 years, the basic materials for nuclear fission even sufficing for 25,000 years. This consideration, however, leads to false conclusions. It is necessary to take into account the world's population growth as well as the increasing per capita consumption. The result is that the reserves of fossil fuels would be sufficient for some more years only towards the end of the 21st century, whereas nuclear fuels would suffice for about 300 years. This means that, on one hand, the world will be dependent upon nuclear fusion at long sight, but that, on the other hand, sufficient time will be left to develop it.

Author (NSA)

N72-17737# Oak Ridge National Lab., Tenn.

ROD : A NUCLEAR AND FUEL CYCLE ANALYSIS CODE FOR CIRCULATING FUEL REACTORS

H. F. Bauman, G. W. Cunningham, III, J. L. Lucius, H. T. Kerr, and C. W. Craven, Jr. Sep. 1971 244 p refs

(Contract W-7405-eng-26)

(ORNL-TM-3359) Avail: NTIS

ROD (reactor optimum design) is a computer code for simultaneously optimizing the core design and performing the fuel-cycle analysis for circulating-fuel reactors. It consists of a multigroup diffusion calculation, including multiple thermal groups with neutron upscatter, in one-dimension or in two-dimensional synthesis, combined with an equilibrium fuel-cycle calculation. Cross sections in the CITATION format are required. The equilibrium calculation is a fuel cycle model, including the effects of processing and of nuclear transmutation and decay. Fuel-cycle costs and fission-product concentrations are calculated, the fission products by an independent calculation from internally stored two-group cross sections. Special features of ROD are an

optimization routine based on the gradient-projection method, a flux-plotting option, and a subprogram for simple time-dependent calculations based on reaction rates from the main program.

Author (NSA)

N72-18760# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.

CLEAN AUTOMOTIVE FUEL: LABORATORY-SCALE OPERATION OF THE SYNTHANE PROCESS

A. J. Forney, W. P. Haynes, J. J. Elliott, and R. F. Kenny Feb. 1972 8 p refs
(TPR-49) Avail: NTIS

A high-Btu gas was made in order to demonstrate the feasibility of using the gas as a nonpolluting fuel for automobiles. The pilot plants were revised to combine the processes of coal gasification, gas purification, and catalytic methanation into one overall system. Tests in test automobiles showed the Synthane gas was less polluting than natural gas.

Author

N72-18761# Bureau of Mines, Bartlesville, Okla. Energy Research Center.

CLEAN AUTOMOTIVE FUEL: ENGINE EMISSIONS USING NATURAL GAS, HYDROGEN-ENRICHED NATURAL GAS, AND GAS MANUFACTURED FROM COAL (SYNTANE)

D. B. Eccleston and R. D. Fleming Feb. 1972 15 p refs
(TPR-48) Avail: NTIS

Natural gas and mixtures of natural gas and hydrogen were used as fuels in a laboratory engine to determine the relationship of emissions to air-fuel ratio and to establish practical lean limits for air-fuel ratio. Synthetic gas manufactured from coal (Synthane) and natural gas were used as fuels in a vehicle to obtain comparative data on emissions and performance. Results showed that lean limits for air-fuel ratio when using hydrogen-enriched natural gas were extended significantly beyond that of natural gas. Synthane produced exhaust that was significantly less reactive than exhaust from natural gas. With lean air-fuel ratios, the acceleration performance of a vehicle fueled with Synthane was improved over its performance when fueled with natural gas.

Author

N72-19686# Environmental Protection Agency, Research Triangle Park, N.C.

COMPILATION OF AIR POLLUTANT EMISSION FACTORS

Feb. 1972 172 p refs Revised
(AP-42-Rev) Avail: SOD \$1.50

Emission data are presented from source tests, material balance studies, engineering estimates, etc., for use by individuals and groups responsible for conducting air pollution emission inventories. The emission factors given cover most of the common emission categories: fuel combustion by stationary and mobile sources; combustion of solid wastes; evaporation of fuels; solvents, and other volatile substances; industrial processes; and miscellaneous sources. When no source test data are available, these factors can be used to estimate the quantities of primary pollutants (particulates, CO, SO₂, NO_x, and hydrocarbons) being released from a source or source group.

Author

N72-20472# Grand Junction Office (AEC), Colo.
STATISTICAL DATA OF THE URANIUM INDUSTRY

1 Jan. 1971 54 p
(TID-25814) Avail: NTIS

A compilation of historical facts and figures and current status as of Jan. 1, 1971 of the U.S. uranium industry is presented. Information is included on ore and concentrate purchases, uranium resources, distribution of deposits, drilling statistics, land acquisition for U mining and exploration, employment, domestic U₃O₈ sales and projected requirements, and processing mills.

NSA

N72-20479# Toronto Univ. (Ontario). Inst. for Aerospace Studies.

THE DEVELOPMENT OF AN AIRBORNE REMOTE LASER

FLUOROSENSOR FOR USE IN OIL POLLUTION DETECTION AND HYDROLOGIC STUDIES

R. M. Measures and M. Bristow Dec. 1971 36 p refs
Sponsored by Dept. of Energy, Mines, and Resources
(UTIAS-175) Avail: NTIS

The first phase of a development program devoted to the exploitation of laser induced fluorescence for environmental sensing has been completed. A prototype laser fluorosensor has been constructed and used to evaluate, in the laboratory, the feasibility of this concept and to explore the potential range of applications. Special attention has been given to assessing the ability of a laser fluorosensor to map the extent of an oil slick, locate the source of lignin sulphonate pollution and monitor the dispersal of a tracer dye for hydrologic uses. The preliminary results are very encouraging and lead to prediction that a laser fluorosensor could be used for environmental sensing from an aircraft flying at between 1000 and 2000 ft on a 24-hour basis.

Author

N72-20603# Aktiebolaget Atomenergi, Studsvik (Sweden).

URANIUM MARKET

1971 30 p refs In SWEDISH

(NP-19069; AES-8) Avail: AEC Depository Libraries

The demand for uranium for use in nuclear power stations is projected to 1985 for the western world. The resources of uranium in western countries and the prospecting efforts are described. Present and future prices of uranium oxides are surveyed.

NSA

N72-23284 Barringer Research, Ltd., Rexdale (Ontario).

CORRELATION SPECTROMETRY APPLIED TO EARTH RESOURCES

Anthony R. Barringer In Princeton Univ. Proc. of the Princeton Univ. Conf. on Aerospace Methods for Revealing and Evaluating Earth's Resources Jun. 1970 37 p
Copyright. Avail: Issuing Activity

Spectrometry from aircraft, balloons, and satellites is discussed for detecting minerals and oils, air pollution, and earth structural features. The emphasis is on gases, and in particular air pollutants: sulfur dioxide, nitrogen dioxide, mercury, and iodine. The association of certain gases with mines and mineral deposits and with marine life is described, and aerial detection of air pollution over cities and industrial areas is also discussed.

N.E.N.

N72-23295 United Nations, New York. Resources and Transport Div.

THE EXPLORATION OF NON-AGRICULTURAL NATURAL RESOURCES IN DEVELOPING COUNTRIES BY THE UNITED NATIONS

Joseph Barnea In Princeton Univ. Proc. of the Princeton Univ. Conf. on Aerospace Methods for Revealing and Evaluating Earth's Resources Jun. 1970 6 p refs

Copyright. Avail: Issuing Activity

The work of the Economic and Social Affairs Department of the United Nations in exploring resources of economic significance is outlined. The main thrust is in the execution of projects in developing countries. Activities are reported on exploring for minerals (including copper and uranium), ground water, rivers and river basins, steam fields (geothermal energy), offshore petroleum, and offshore tin.

N.E.N.

N72-23655# Department of Transportation, Washington, D.C. Library Services Div.

AIRCRAFT AND AIR POLLUTION, SELECTED READINGS Report for 1960 - 1971

Dorothy J. Poehlman Dec. 1971 68 p
(AD-735943; Bibliographic-List-7) Avail: NTIS CSCL 13/2

Presented is a selected, partially annotated listing of papers, reports, and periodical articles, on the subject of environmental pollution caused by aircraft emissions. Noise pollution is not

03 OTHER PRIMARY ENERGY SOURCES

included. The period covered is from approximately 1960 - Spring 1971. The arrangement is by subject categories with author, corporate source and geographic indexes. Author (GRA)

N72-23806# Shell Development Co., Emeryville, Calif.
HYDROCARBON FUELS FOR ADVANCED SYSTEMS
Annual Technical Report No. 2, 1 Sep. 1970 - 31 Aug. 1971
L. E. Faith, G. H. Ackerman, C. K. Heck, H. T. Henderson, A. W. Ritchie, and L. B. Ryland Wright-Patterson AFB, Ohio AFAPL Dec. 1971 270 p refs
(Contract F33615-70-C-1038; AF Proj. 3048)
(AD-737372; S-14120; AFAPL-TR-70-71-Pt-2) Avail: NTIS CSCL 21/2

The general objective was the development of new hydrocarbon fuels and new fuel systems which will meet the cooling and propulsion requirements of advanced air-breathing engines. The preparation of catalysts for both packed bed and catalyst lined reactors and the evaluation of catalyst activity and stability for the dehydrogenation of methylcyclohexane and decalin discussed. Several catalyst lined reactors were tested under realistic heat transfer and reaction conditions. The Beta-Ray Deposit Rater was developed, tested, and used to rate coke deposits on tubes from thermal stability tests. The effects of various stability additives in different fuels were investigated. Viscosities of different hydrocarbons, including sheldyne H and sheldyne - H/hydrocarbon mixtures, were measured. The effects of exposure to elastomers on the properties of sheldyne - H fuel were analyzed. Ignition delay times and combustion rates were measured for decalin and its dehydrogenation products. A bibliography of current articles and patents of interest to this and related programs is included. Author (GRA)

N72-24703# Oak Ridge National Lab., Tenn.
ORNL ISOTOPIC POWER FUELS Quarterly Report, period ending 30 Sep. 1971
Eugene Lamb Dec. 1971 36 p refs
(Contract W-7405-eng-26)
(ORNL-4750) Avail: NTIS

The development of fuel forms with optimum design for use at temperature up to 2,000 C is discussed. The process involves obtaining the characteristics of isotopic power and heat sources for anticipated applications in aerospace, terrestrial, and marine environments. The physical and chemical properties of the compound and source form, such as thermal conductivity, density, gas retention, and melting point must be determined. Compatibility of the fuel form with container materials must be established to ensure adequate containment during the intended lifetime of the mission. Author

N72-25345*# Techtran Corp., Glen Burnie, Md.
THE EOLE PROGRAM
Washington NASA 28 Feb. 1972 32 p Transl. into ENGLISH from "Le Programme Eole", Centre Natl. d'Etudes Spatiales, Paris, France, 1972 31 p
(Contract NASw-2037)
(NASA-TT-F-14279) Avail: NTIS HC \$3.75 CSCL 08C

The Eole program is an experimental program to determine the effectiveness of satellite monitoring of drifting buoys and balloons in the Southern Hemisphere. The results of the program thus far are summarized, and the future need and demand for this type of service in determining the position of ships and in collecting and transmitting data of hydrological, oceanographic, and meteorological interest are considered. Author

N72-25584# Bureau of Mines, Bartlesville, Okla.
A FIELD SURVEY OF EMISSIONS FROM AIRCRAFT TURBINE ENGINES
F. W. Cox, F. W. Penn, and J. O. Chase 1972 32 p refs
(BM-RI-7634) Avail: NTIS HC \$3.75

Exhaust emissions were measured from 25 aircraft turbine engines using Jet A fuel. Analytical apparatus, procedures, and results are described. Carbon monoxide, carbon dioxide, nitric oxide, nitrogen dioxide, and aldehydes were measured at engine operating modes representing power levels used in airline operation. Carbon monoxide, hydrocarbon, and aldehyde emissions were highest at idle and lowest at takeoff; oxides of nitrogen were lowest at idle and highest at takeoff. Of the total oxides of nitrogen emitted, nitrogen dioxide constituted from 10 to 100 pct, depending on the exhaust gas temperature. Engines retrofitted with smoke reducing burner cans produced less carbon monoxide, hydrocarbon, and aldehyde emissions, and slightly more oxides of nitrogen than engines with standard burner cans. Author

N72-25955*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
APPLICABILITY OF NASA CONTRACT QUALITY MANAGEMENT AND FAILURE MODE EFFECT ANALYSIS PROCEDURES TO THE USGS OUTER CONTINENTAL SHELF OIL AND GAS LEASE MANAGEMENT PROGRAM
Morris K. Dyer, Dewey G. Little, Earl G. Hoard, Alfred C. Taylor, and Rayford Campbell Washington Jun. 1972 43 p refs
(NASA-TM-X-2567) Avail: NTIS HC \$3.00 CSCL 05A

An approach that might be used for determining the applicability of NASA management techniques to benefit almost any type of down-to-earth enterprise is presented. A study was made to determine the following: (1) the practicality of adopting NASA contractual quality management techniques to the U.S. Geological Survey Outer Continental Shelf lease management function; (2) the applicability of failure mode effects analysis to the drilling, production, and delivery systems in use offshore; (3) the impact on industrial offshore operations and onshore management operations required to apply recommended NASA techniques; and (4) the probable changes required in laws or regulations in order to implement recommendations. Several management activities that have been applied to space programs are identified, and their institution for improved management of offshore and onshore oil and gas operations is recommended. Author

N72-25986*# National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.
RELIABILITY TECHNIQUES IN THE PETROLEUM INDUSTRY
Henry L. Williams In its Govt.-Ind. System Safety Conf. 28 May 1971 p 259-270
Avail: NTIS HC \$16.25 CSCL 13L

Quantitative reliability evaluation methods used in the Apollo Spacecraft Program are translated into petroleum industry requirements with emphasis on offsetting reliability demonstration costs and limited production runs. Described are the qualitative disciplines applicable, the definitions and criteria that accompany the disciplines, and the generic application of these disciplines to the chemical industry. The disciplines are then translated into proposed definitions and criteria for the industry, into a base-line reliability plan that includes these disciplines, and into application notes to aid in adapting the base-line plan to a specific operation. G.G.

N72-26334 Idaho Univ., Moscow.
THIRTY-FIVE MILLIMETER COLOR OBLIQUE AERIAL PHOTOGRAPHY AS A TOOL FOR RECONNAISSANCE EXPLORATION FOR URANIUM MINERALIZATION IN THE TERTIARY BASINS OF WYOMING Ph.D. Thesis
Stanley Cameron Grant 1971 236 p
Avail: Univ. Microfilms Order No. 72-2083

An evaluation of techniques, films, and procedures for 35mm color aerial photography in uranium mineral exploration is presented. The Tertiary rocks of the Clarkson Hill-Rattlesnake Range area, 22 miles southwest of Casper, Wyoming, were studied. The Munsell Color System was selected to identify the color in soils and rocks. Soil and rock samples were analyzed by

03 OTHER PRIMARY ENERGY SOURCES

qualitative emission spectrography to determine possible controls for color. Interpretation of analyses supports findings of others that colors result from oxides of iron in varying quantities. The geology of the primary area was studied to provide an accurate ground basis for aerial photography and to determine locations favorable for uranium mineralization. Tertiary formations and structure were mapped. Dissert. Abstr.

N72-26528* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

NEUTRON RADIATION CHARACTERISTICS OF PLUTONIUM DIOXIDE FUEL

Mojtaba Taherzadeh 1 Jun. 1972 22 p refs

(Contract NAS7-100)

(NASA-CR-127045; JPL-TR-32-1555) Avail: NTIS HC \$3.25 CSCL 18J

The major sources of neutrons from plutonium dioxide nuclear fuel are considered in detail. These sources include spontaneous fission of several of the Pu isotopes, (α, n) reactions with low Z impurities in the fuel, and (α, n) reactions with O-18. For spontaneous fission neutrons a value of $(1.95 \pm 0.07) \times 10,000$ n/s/g PuO₂ is obtained. The neutron yield from (α, n) reactions with oxygen is calculated by integrating the reaction rate equation over all alpha-particle energies and all center-of-mass angles. The results indicate a neutron emission rate of $(1.14 \pm 0.26) \times 10,000$ n/s/g PuO₂. The neutron yield from (α, n) reactions with low Z impurities in the fuel is presented in tabular form for one part per million of each impurity. The total neutron yield due to the combined effects of all the impurities depends upon the fractional weight concentration of each impurity. The total neutron flux emitted from a particular fuel geometry is estimated by adding the neutron yield due to the induced fission to the other neutron sources. Author

N72-29272* New York State Univ., Albany.
TO EVALUATE ERTS-A DATA FOR USEFULNESS AS GEOLOGICAL SENSOR Progress Report, period ending 31 Jul. 1972

Y. W. Isachsen, Principal Investigator 31 Jul. 1972 2 p Sponsored by NASA

(E72-10020; NASA-CR-127744) Avail: NTIS HC \$3.00 CSCL 08G

There are no author-identified significant results in this report.

N72-29317* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
LEWIS RESEARCH CENTER EARTH RESOURCES PROGRAM

Herman Mark In its 4th Ann. Earth Resources Program Rev., Vol. 1 21 Jan. 1972 21 p

CSCL 08L

The Lewis Research Center earth resources program efforts are in the areas of: (1) monitoring and rapid evaluation of water quality; (2) determining ice-type and ice coverage distribution to aid operations in a possible extension of the Great Lakes ice navigation and shipping season; (3) monitoring spread of crop viruses; and (4) extent of damage to strip mined areas as well as success of efforts to rehabilitate such areas for agriculture. Author

N72-29363* Bureau of Mines, Pittsburgh, Pa.
THE REMOTE SENSING OF AIR POLLUTION FROM COAL UTILIZATION c20

Brian M. Harney, Donald H. McCrea, and Albert J. Forney In NASA. Manned Spacecraft Center 4th Ann. Earth Resources Program Rev., Vol. 3 21 Jan. 1972 14 p refs Original contains color illustrations

CSCL 04B

An investigation was made to determine the feasibility of applying earth resources data to the detection of air pollution, particularly pollution from coal burning. Efforts were also made to detect any damage caused by such pollution to vegetation growth and tree life. Results show that vegetative vigor even at low ambient concentrations was damaged and that Eastern white pine trees were severely damaged by the pollutants. Author

N72-30123# Bureau of Mines, Morgantown, W.Va.
BUREAU OF MINES ENERGY PROGRAM, 1971

John D. Spencer and Bill Linville 1972 109 p refs (BM-IC-8551) Avail: NTIS HC \$7.50

In 1971 increase emphasis was placed on the production of fluid fuels and chemicals from coal. Advances were achieved in the development of the Synthene and Hydrane gasification processes for producing pipeline gas from coal, and progress was made in research on solid wastes utilization, and on liquid fuels production from coal. Coal mine safety, solid waste disposal and utilization, coal preparation and transport, and fundamental research on coal and related products also continued to be the subject of extensive research. Improved methods for extracting petroleum and natural gas without surface and subsurface pollution are discussed. This research was highlighted by studies of the fracturing systems of reservoir rocks, including subsurface fracture mapping and fracturing techniques to achieve optimum production of oil and gas. Oil recovery by water or gas flooding, by steam injection, on the identification of oil spills, and on means to reduce vehicular exhaust emissions is summarized. Author

N72-31082# Army Foreign Science and Technology Center, Charlottesville, Va.

SERIES OF NO-CONTACT SYNCHRONOUS GENERATORS WITH OUTPUTS UP TO 100 kV FOR WIND DRIVEN ELECTRIC UNITS

L. D. Urusov, V. S. Ryzhkov, L. A. Zilbershtein, and V. K. Volchkov 7 Oct. 1971 12 p refs Transl. into ENGLISH from Elektrotehnika (USSR), no. 1, 1970 p 56-58

(AD-742841; FSTC-HT-23-1434-71) Avail: NTIS CSCL 10/2

The need for design of a specialized series of no-contact synchronous generators with outputs up to 100 kV for wind-driven electric units and the basic technical characteristics of the series of generators are discussed. Author (GRA)

N72-31363* Bendix Corp., Ann Arbor, Mich.
ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO Progress Report, period ending 5 Aug. 1972

Phillip E. Chase, Principal Investigator 5 Aug. 1972 3 p

(Contract NAS5-21762)

(E72-10069; NASA-CR-128084; Rept-72-141-922) Avail: NTIS HC \$3.00 CSCL 08G

There are no author-identified significant results in this report.

N72-31768# Bureau of Mines, Bartlesville, Okla. Energy Research Center.

EMISSION CHARACTERISTICS OF PROPANE AS AUTOMOTIVE FUEL

J. R. Allsup and R. D. Fleming [1972] 38 p refs

(BM-RI-7672; TN23.U7) Avail: NTIS HC \$4.00

Air pollutants in exhaust gas produced from LP-gas (propane) were studied using both laboratory engines and vehicles. The objective was to evaluate engine parameters relating to the advantageous use of propane as a low-pollution fuel. Some comparisons are made between gasoline, natural gas, and propane. Results show that engines can operate over a wider range of A/F with minimum carbon monoxide and hydrocarbon emission when using propane than when using gasoline. Mixture enrichment using propane is unnecessary during cold starts, thereby eliminating the emission penalty during warmup. Carbon monoxide and hydrocarbon emission using propane are unaffected

03 OTHER PRIMARY ENERGY SOURCES

by ambient temperature. The photochemical reactivity of hydrocarbon emission is considerably lower with propane than with gasoline. Author

N72-32336* Earth Satellite Corp., Washington, D.C.
STUDY OF APPLICATION OF ERTS-1 IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Jul. - 1 Sep. 1972
Charles Wier, Principal Investigator (Indiana Geol. Surv., Bloomington), Frank J. Wobber, Principal Investigator, Orville R. Russell, and Roger Amato 1 Sep. 1972 3 p Sponsored by NASA
(E72-10064; NASA-CR-128080) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. Numerous fractures are identifiable on the 1:120,000 color infrared photography. Some of these fractures are in the proximity of operating open pit mines and should provide opportunities for field checking and confirmation.

N72-32742* National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
ECONOMIC STUDY OF FUTURE AIRCRAFT FUELS (1970-2000)

Arthur D. Alexander, III Sep. 1972 30 p refs
(NASA-TM-X-62180) Avail: NTIS HC \$3.50 CSCL 21D
Future aircraft fuels are evaluated in terms of fuel resource availability and pricing, processing methods, and economic projections over the period 1970-2000. Liquefied hydrogen, methane and propane are examined as potential turbine engine aircraft fuels relative to current JP fuel. Author

N72-32754* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.
AIRCRAFT ENGINE POLLUTION REDUCTION
Richard A. Rudey 1972 10 p refs Presented at EASCON 72, Washington, D. C., 16-17 Oct. 1972
(NASA-TM-X-68129; E-7118) Avail: NTIS HC \$3.00 CSCL 21A

The effect of engine operation on the types and levels of the major aircraft engine pollutants is described and the major factors governing the formation of these pollutants during the burning of hydrocarbon fuel are discussed. Methods which are being explored to reduce these pollutants are discussed and their application to several experimental research programs is pointed out. Results showing significant reductions in the levels of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen obtained from experimental combustion research programs are presented and discussed to point out potential application to aircraft engines. Author

N72-33736* Naval Postgraduate School, Monterey, Calif.
THE IDENTIFICATION OF NAVAL FUELS AND NATURAL FLUOROPHORS IN SEA WATER BY FLUORESCENCE SPECTROMETRY M.S. Thesis
Hugh W. Howard, Jr. Mar. 1972 82 p refs
(AD-743703) Avail: NTIS CSCL 21/4

Fluorescence and Excitation spectra of Navy Standard Fuel Oil (NSFO), Navy Distillate Fuel (ND), Diesel Fuel and Navy Aircraft fuels (JP-4 and JP-5) were obtained. Excitation spectra and fluorescence spectra are characteristic and may allow selective identification of these fuels. Quantitative determinations by fluorescence analysis of ND fuel oil extracted from sea water samples, with cyclohexane, showed saturation values of approximately 11 ppm. An all glass, in-situ vacuum filtering water sampler was designed and built for collection of filtered (.45 micron glass) noncontaminated sea water samples for the fluorescence analysis determination of the natural background fluorescence. Author (GRA)

N73-10372* Indiana Geological Survey, Bloomington.
STUDY OF THE APPLICATION OF ERTS-A IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Sep. - 31 Oct. 1972
Charles E. Wier, Frank J. Wobber, Principal Investigators (Earth Satellite Corp.), Orville R. Russell (Earth Satellite Corp.), and Roger V. Amato (Earth Satellite Corp.) 8 Nov. 1972 3 p refs
(Contract NAS5-21795)
(E72-10193; NASA-CR-128391; PR-2) Avail: NTIS HC \$3.00 CSCL 08K

The author has identified the following significant results. Various data compilation and analysis activities in support of ERTS-1 imagery interpretation are in progress or are completed. These include the compilation of mine accident data, areas of mine roof instability and the analysis of high altitude color infrared photography and low altitude color and color infrared photography which was acquired by NASA in support of the project. The photography reveals that many fracture lineaments are detectable through a varied thickness of glacial till. These data will be compiled on a series of 1:250,000 scale base maps and evaluated for a correlation between fracture zones and mine accidents and rooffalls. Due to high occurrence of cloud cover in the project area and to the delay in imagery shipments, little progress has been made in the analysis of ERTS-1 imagery.

N73-11019* LTV Aerospace Corp., Hampton, Va. Hampton Technical Center.
A FUEL CONSERVATION STUDY FOR TRANSPORT AIRCRAFT UTILIZING ADVANCED TECHNOLOGY AND HYDROGEN FUEL
W. Berry, R. Callason, J. Espil, C. Quarero, and E. Swanson 10 Nov. 1972 33 p refs
(Contract NAS1-10900)
(NASA-CR-112204) Avail: NTIS HC \$3.75 CSCL 01B

The conservation of fossil fuels in commercial aviation was investigated. Four categories of aircraft were selected for investigation: (1) conventional, medium range, low take-off gross weight; (2) conventional, long range, high take-off gross weights; (3) large take-off gross weight aircraft that might find future applications using both conventional and advanced technology; and (4) advanced technology aircraft of the future powered with liquid hydrogen fuel. It is concluded that the hydrogen fueled aircraft can perform at reduced size and gross weight the same payload/range mission as conventionally fueled aircraft. F.O.S.

N73-12358* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO Bimonthly Progress Report, 6 Aug. - 5 Oct. 1972
Wayne Pettyjohn, Principal Investigator 5 Oct. 1972 4 p
Prepared in cooperation with Ohio State Univ., Columbus
(Contract NAS5-21762)
(E72-10256; NASA-CR-129188; Rept-72-141-1084) Avail: NTIS HC \$3.00 CSCL 08M

There are no author-identified significant results in this report.

N73-12358* Ohio Dept. of Economic and Community Development, Columbus.
RELEVANCE OF ERTS TO THE STATE OF OHIO Progress Report, Oct. - Nov. 1972
David C. Sweet, Principal Investigator Nov. 1972 7 p Prepared for Battelle Columbus Labs. Original contains imagery. Original photography may be purchased from EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21782; BCL-72-17/G-1793)
(E72-10259; NASA-CR-129191) Avail: NTIS HC \$3.00 CSCL 08I

The author has identified the following significant results. The ability to delineate and inventory strip mined areas using ERTS-1 imagery has been established. This gives Ohio a method to rapidly gain an up-to-date inventory of strip mined lands for state planning purposes, which has not been available previously.

03 OTHER PRIMARY ENERGY SOURCES

Smoke plume detection and sedimentation patterns in Sandusky Bay have also been determined from initial analysis of ERTS-1 data.

N73-12364* Tennessee Univ., Knoxville. Dept. of Geography. **REGIONAL LANDSCAPE CHANGE: A CASE FOR ERTS-1** John B. Rehder, Principal Investigator and James R. O'Malley 27 Nov. 1972 10 p Proposed for presentation at 69th Ann. Assoc. of Am. Geographers Meetings, Atlanta, 15-18 Apr. 1973 Submitted for publication. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 (Contract NAS5-21726) (E72-10265; NASA-CR-129227) Avail: NTIS HC \$3.00 CSCL 08M

There are no author-identified significant results in this report.

N73-12717# Oak Ridge National Lab., Tenn. **Cm-244: A RADIOISOTOPIC POWER FUEL** R. E. McHenry 1972 17 p refs Presented at 2d Intern. Symp. on Power from Radioisotopes, Madrid, 29 May 1972 Sponsored by AEC (Conf-720519-1) Avail: NTIS

The alpha-emitting radioisotope curium-244 is being developed by the USAEC as a power source for any of several conversion systems which produce electrical power. Projected costs and availability make this radioisotope especially promising. The cost of curium-244 which is produced in nuclear power reactors is estimated at \$60/Watt (thermal) in quantities of 95 kW (thermal) per year by 1980. The efficient and safe use of this isotopic fuel requires that a suitable compound be prepared and fabricated into a suitable form with fully characterized physical and chemical properties. The task elements for accomplishing this program consist of compound preparation, source fabrication, compound characterization, source design, and prototype testing. Techniques developed for accomplishing these tasks and the results achieved to date are reviewed. Author (NSA)

N73-13334* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div. **DETERMINE UTILITY OF ERTS-1 TO DETECT AND MONITOR AREA STRIP MINING AND RECLAMATION** Interim Report, May - Oct. 1972 Philip E. Chase, Principal Investigator Nov. 1972 9 p (Contract NAS5-21762) (E72-10284; NASA-CR-129273; BSR-3489) Avail: NTIS HC \$3.00 CSCL 08I

There are no author-identified significant results in this report. Analysis of the strip mine records and aerial photos in the test site (five counties in southeastern Ohio) indicate rapidly increasing stripping in the past few years. The mines are large enough to be detected and their gross characteristics observed in the ERTS-1 imagery. Progress in adapting the Bendix ground station to handling ERTS-1 computer compatible tapes is described.

N73-13991* Massachusetts Inst. of Tech., Cambridge. Sloan School of Management. **REWARD AND UNCERTAINTY IN EXPLORATION PROGRAMS** Gordon M. Kaufman and Paul G. Bradley (British Columbia Univ.) [1971] 25 p refs (Grant NGL-22-009-309) (NASA-CR-129595) Avail: NTIS HC \$3.25 CSCL 05A

A set of variables which are crucial to the economic outcome of petroleum exploration are discussed. These are treated as random variables; the values they assume indicate the number of successes that occur in a drilling program and determine, for a particular discovery, the unit production cost and net economic return if that reservoir is developed. In specifying the joint probability law for those variables, extreme and probably unrealistic assumptions are made. In particular, the different random variables are assumed to be independently distributed.

Using postulated probability functions and specified parameters, values are generated for selected random variables, such as reservoir size. From this set of values the economic magnitudes of interest, net return and unit production cost are computed. This constitutes a single trial, and the procedure is repeated many times. The resulting histograms approximate the probability density functions of the variables which describe the economic outcomes of an exploratory drilling program. Author

N73-13992* Massachusetts Inst. of Tech., Cambridge. Sloan School of Management. **TWO STOCHASTIC MODELS USEFUL IN PETROLEUM EXPLORATION** Gordon M. Kaufman and Paul G. Bradley (British Columbia Univ.) [1972] 19 p refs (Grant NGL-22-009-309) (NASA-CR-129611) Avail: NTIS HC \$3.00 CSCL 05A

A model of the petroleum exploration process that tests empirically the hypothesis that at an early stage in the exploration of a basin, the process behaves like sampling without replacement is proposed along with a model of the spatial distribution of petroleum reservoirs that conforms to observed facts. In developing the model of discovery, the following topics are discussed: probabilistic proportionality, likelihood function, and maximum likelihood estimation. In addition, the spatial model is described, which is defined as a stochastic process generating values of a sequence of random variables in a way that simulates the frequency distribution of areal extent, the geographic location, and shape of oil deposits. F.O.S.

N73-14315* Eason Oil Co., Oklahoma City, Okla. **AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION** Interim Report, Jun. - Nov. 1972 Robert Collins, Principal Investigator Dec. 1972 8 p (Contract NAS5-21735) (E72-10327; NASA-CR-129585) Avail: NTIS HC \$3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-14343* Tennessee Univ., Knoxville. Dept. of Geography. **GEOGRAPHIC APPLICATIONS OF ERTS-A IMAGERY TO RURAL LANDSCAPE CHANGE** Progress Report John B. Rehder, Principal Investigator Dec. 1972 34 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 (Contract NAS5-21726) (E72-10355; NASA-CR-129668) Avail: NTIS HC \$3.75 CSCL 08F

There are no author-identified significant results in this report. The study area, centered on Knoxville, Tennessee, encompasses nearly 20,000 square miles. The Knoxville Test Site, an 11 x 21 mile area over the city of Knoxville and the western portion of Knox County, has been chosen for the analysis of landscape change detection associated with urban growth. The second area, the Cumberland Plateau Test Site, exhibits landscape change through forest alterations and landform disturbances associated with strip mining in the area and was so chosen for its sharp contrasts in physical and human phenomena as well as its change dynamics. Accomplishments since reception of ERTS-1 imagery include: (1) basic cataloging and classifying of the data into a filing system; (2) a densitometer analysis; (3) first look analysis; and (4) preparation of results from the project. Examples of all four bands of the MSS have been received and analyses reveal distinctive positive and negative reactions. Band 5 has been found to be best for landscape analysis of contrasts between urban and rural landscapes, and band 7 for topographic features and water surfaces. Preliminary results are summarized. A.L.

N73-14400# Woods Hole Oceanographic Institution, Mass. **EASTERN ATLANTIC CONTINENTAL MARGIN PROGRAM OF THE INTERNATIONAL DECADE OF OCEAN EXPLORA-**

03 OTHER PRIMARY ENERGY SOURCES

TION (GX-28193), SOME RESULTS OF 1972 CRUISE OF R/V ATLANTIS 2

K. O. Emery Jul. 1972 18 p refs

(Grant NSF GX-28193)

(PB-211393; WHOI-Ref-72-54) Avail: NTIS HC \$3.00 CSCL 08G

A geophysical cruise to the southeastern Atlantic mapped a large ancient delta of the Orange River and a diapiric field off Angola. Both features were initiated during early stages of the separation between Africa and South America, and both may have future economic oil potential. Author (GRA)

N73-15309* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TABLES OF CRITICAL-FLOW FUNCTIONS AND THERMODYNAMIC PROPERTIES FOR METHANE AND COMPUTATIONAL PROCEDURES FOR BOTH METHANE AND NATURAL GAS

Robert C. Johnson Washington 1972 73 p

(NASA-SP-3074) Avail: NTIS HC \$3.00 CSCL 20D

Procedures for calculating the mass flow rate of methane and natural gas through nozzles are given, along with the FORTRAN 4 subroutines used to make these calculations. Three sets of independent variables are permitted in these routines. In addition to the plenum pressure and temperature, the third independent variable is either nozzle exit pressure, Mach number, or temperature. A critical-flow factor that becomes a convenient means for determining the mass flow rate of methane through critical-flow nozzles is tabulated. Other tables are included for nozzle throat velocity and critical pressure, density, and temperature ratios, along with some thermodynamic properties of methane, including compressibility factor, enthalpy, entropy, specific heat, specific-heat ratio, and speed of sound. These tabulations cover a temperature range from 120 to 600 K and pressures to 3 million N/sq m. Author

N73-16340* Texas Instruments, Inc., Dallas.

EVALUATION OF COMMERCIAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM Progress Report, 1 Nov. - 31 Dec. 1972

Donald F. Saunders, Principal Investigator 8 Jan. 1973 4 p (Contract NAS5-21796)

(E73-10004; NASA-CR-129928) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. Initial analytical results in Area 3 have been very encouraging. Not only have new major lineaments been detected but many of the intersections of those lineaments correlate with the general location of known mineral deposits while others appear to outline petroleum-bearing basins and uplifts. If later analyses confirm these results the economic impact of ERTS type imagery could be very significant in worldwide mineral and petroleum reconnaissance.

N73-16365* State of Ohio Dept. of Development, Columbus. RELEVANCE OF ERTS-1 TO THE STATE OF OHIO Semiannual Progress Report, Jul. - Dec. 1972

David C. Sweet, Principal Investigator, T. L. Wells, and G. E. Wukelic 15 Jan. 1973 41 p Prepared for Battelle Columbus Labs. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198

(Contracts NAS5-21782; BCL-72-17/G-1793)

(E73-10032; NASA-CR-129985; SAPR-1) Avail: NTIS HC \$4.25 CSCL 08F

The author has identified the following significant results. To date, only one significant result has been reported for the Ohio ERTS program. This result relates to the proven usefulness of ERTS-1 imagery for mapping and inventorying strip-mined areas in southeastern Ohio. ERTS provides a tool for rapidly and economically acquiring an up-to-date inventory of strip-mined lands for state planning purposes which was not previously possible.

N73-15454* Informatics, Inc., Rockville, Md.

RECENT SOVIET INVESTIGATIONS IN GEOTHERMY

Eleanor M. Rowell and Stuart G. Hibben May 1972 91 p refs

(Contract F44620-72-C-0053; ARPA Order 1622)

(AD-750128; AFOSR-72-1959TR; Rept-1) Avail: NTIS CSCL 08/7

The report presents the results obtained in an attempt to provide information on recent Soviet research on geothermy. Emphasis is on the identification and description of high-intensity heat flow areas in the USSR that have or might become potential sites for geothermal power or space heating developments. In general, the information provided consists of background data (geographical, geological and chemical) covering recently investigated areas. Author (GRA)

N73-16771* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMPARISON OF COMBUSTION CHARACTERISTICS OF ASTM A-1, PROPANE, AND NATURAL-GAS FUELS IN AN ANNULAR TURBOJET COMBUSTOR

Jerrold D. Wear and Robert E. Jones Washington Jan. 1973 23 p refs

(NASA-TN-D-7135; E-7078) Avail: NTIS HC \$3.00 CSCL 21D

The performance of an annular turbojet combustor using natural-gas fuel is compared with that obtained using ASTM A-1 and propane fuels. Propane gas was used to simulate operation with vaporized kerosene fuels. The results obtained at severe operating conditions and altitude relight conditions show that natural gas is inferior to both ASTM A-1 and propane fuels. Combustion efficiencies were significantly lower and combustor pressures for relight were higher with natural-gas fuel than with the other fuels. The inferior performance of natural gas is shown to be caused by the chemical stability of the methane molecule. Author

N73-16948# Delaware Bay Oil Transport Committee, Dover. ENERGY, OIL, AND THE STATE OF DELAWARE. A PROPOSAL FOR SAFEGUARDING THE DELAWARE ESTUARY AND COASTLINE BY SAFER TRANSPORT OF OIL

15 Jan. 1973 61 p refs

Avail: NTIS HC \$5.25

The pollution hazards of petroleum industries and shipping in the Delaware Bay are considered. Petroleum refineries on the Delaware River, Delaware River traffic, lightering operations in the lower bay, cleanup responsibility of spilled oil, oil imports, and world crude oil transportation are discussed along with alternative petroleum transport systems. Recommendations for the increased protection from spills are included. F.O.S.

N73-17719# Commissariat a l'Energie Atomique, Bruyeres-le-Chatel (France). Centre d'Etudes Nucleaires.

PEACEFUL APPLICATIONS OF NUCLEAR EXPLOSIONS: MINES, CHEMISTRY, AND GAS AND OIL EXTRACTION

Micheline C. Berton Aug. 1972 285 p refs Partly in ENGLISH; mostly in FRENCH

(CEA-Bib-129-Add-1) Avail: AEC Depository Libraries

This bibliography is complementary to the bibliography CEA-BIB-129 written in 1968. It comprises 788 references covering principally the following domains: Nuclear Science Abstracts; Government Research Abstracts; Scientific and Technical Aerospace Reports; Bulletin Signaletique de la C.N.R.S.; Index de la Litterature Nucleaire Francaise; and Reports and books of the Central Library of Saclay. The documents are presented in a number of chapters indicated in a subject index table. Several indexes appear at the end of the bibliography: authors index, index of reports, index of review articles, index of congresses, index of books, and a patents index. NSA

N73-17916* Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.

EFFECT OF FUEL ZONING AND FUEL NOZZLE DESIGN

ON POLLUTION EMISSIONS AT GROUND IDLE CONDITIONS FOR A DOUBLE-ANNULAR RAM-INDUCTION COMBUSTOR

Final Report
T. R. Clements Feb. 1973 61 p refs.

(Contract NAS3-11159)

(NASA-CR-121094; FR-5295) Avail: NTIS HC \$5.25 CSCI 21B

An exhaust emission survey was conducted on a double-annular ram induction combustor at simulated ground idle conditions. The combustor was designed for a large augmented turbofan engine capable of sustained flight speeds up to Mach 3.0. The emission levels of total hydrocarbon (THC), carbon monoxide, carbon dioxide, and nitric oxide were measured. The effects of fuel zoning, fuel nozzle design, and operating conditions (inlet temperature and reference Mach number) on the level of these emissions were determined. At an overall combustor fuel/air ratio of 0.007, fuel zoning reduced THC emissions by a factor of 5 to 1. The reduction in THC emissions is attributed to the increase in local fuel/air ratio provided by the fuel zoning. An alternative method of increasing fuel/air ratio would be to operate with larger-than-normal compressor overboard bleed; however, analysis on this method indicated an increase in idle fuel consumption of 20 percent. The use of air-atomizing nozzles reduced the THC emissions by 2 to 1. Author

N73-18321* Indiana Geological Survey, Bloomington. Coal Section.

APPLICATION OF ERTS-A IMAGERY TO FRACTURE RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY

Progress Report, Jul. 1972 - Jan. 1973
Charles E. Wier and Frank J. Wobber, Principal Investigators
Jan. 1973 52 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21795)

(E73-10096; NASA-CR-130345) Avail: NTIS HC \$4.75 CSCI 08I

The author has identified the following significant results. The most important result to date is the demonstration of the special value of repetitive ERTS-1 multiband coverage for detecting previously unknown fracture lineaments despite the presence of a deep glacial overburden. The Illinois Basin is largely covered with glacial drift and few rock outcrops are present. A contribution to the geological understanding of Illinois and Indiana has been made. Analysis of ERTS-1 imagery has provided useful information to the State of Indiana concerning the surface mined lands. The contrast between healthy vegetation and bare ground as imaged by Band 7 is sharp and substantial detail can be obtained concerning the extent of disturbed lands, associated water bodies, large haul roads, and extent of mined lands revegetation. Preliminary results of analysis suggest a reasonable correlation between image-detected fractures and mine roof fall accidents for a few areas investigated. ERTS-1 applications to surface mining operations appear probable, but further investigations are required. The likelihood of applying ERTS-1 derived fracture data to improve coal mine safety in the entire Illinois Basin is suggested from studies conducted in Indiana.

N73-18353* Geological Survey, Menlo Park, Calif.

IDENTIFICATION OF GEOSTRUCTURES OF CONTINENTAL CRUST PARTICULARLY AS THEY RELATE TO MINERAL RESOURCE EVALUATION

Progress Report, 1 Jul. - 31 Dec. 1972
George Gryc, Principal Investigator and Ernest H. Lathram
31 Dec. 1972 5 p
(NASA Order S-70243-AG-1)
(E73-10321; NASA-CR-130739) Avail: NTIS HC \$3.00 CSCI 08G

The author has identified the following significant results. Lakes in the Arctic Coastal Plain of Alaska are dominantly elongate, with their long axes parallel and trending about N 9 W. On ERTS-1 imagery, an additional strong east-trending regional lineation, not previously recognized on aerial photographs or in field study, was noted. In addition, the alignment of many small

lakes forms a large and a small ellipse superimposed on the regional lineation. Fischer and Lathram find that the trend of this lineation is parallel to the trend of deflections in contours of the magnetic and gravity fields in the area, and parallel to westerly deflections in the northwest ends of northwest-trending folds mapped to the south. These data suggest that heretofore unsuspected structures may be concealed beneath Quaternary mantling sediments in the area of the image. The strata in these folds would be younger than those tapped by the oil wells of the Umiat field to the south, and favorable sandstone facies may occur in the area. The significance of these observations to oil exploration in northern Alaska needs to be evaluated further.

N73-18354* Eason Oil Co., Oklahoma City, Okla.

AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION

Progress Report, Dec. 1972 - Jan. 1973
Robert J. Collins, Jr., Principal Investigator 7 Mar. 1973 4 p
(Contract NAS5-21735)
(E73-10322; NASA-CR-130740) Avail: NTIS HC \$3.00 CSCI 08G

There are no author-identified significant results in this report.

N73-18960* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

PERFORMANCE GAINS BY USING HEATED NATURAL-GAS FUEL IN AN ANNULAR TURBOJET COMBUSTOR

Nicholas R. Marchionna Washington Mar. 1973 20 p refs
(NASA-TM-X-2742; E-7236) Avail: NTIS HC \$3.00 CSCI 21E

A full-scale annular turbojet combustor was tested with natural gas fuel heated from ambient temperature to 800 K (980 F). In all tests, heating the fuel improved combustion efficiency. Two sets of gaseous fuel nozzles were tested. Combustion instabilities occurred with one set of nozzles at two conditions: one where the efficiency approached 100 percent with the heated fuel; the other where the efficiency was very poor with the unheated fuel. The second set of nozzles exhibited no combustion instability. Altitude relight tests with the second set showed that relight was improved and was achievable at essentially the same condition as blowout when the fuel temperature was 800 K (980 F).

Author

N73-19366* Earth Satellite Corp., Washington, D.C.

STUDY OF APPLICATION OF ERTS-A IMAGERY TO FRACTURE RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY

Progress Report, 1 Jan. - 1 Mar. 1973
Charles E. Wier, Frank J. Wobber, Principal Investigators, Orville R. Russell, and Roger Amato 16 Mar. 1973 10 p Prepared for Ind. Geol. Surv.
(Contract NAS5-21795)
(E73-10371; NASA-CR-131012) Avail: NTIS HC \$3.00 CSCI 08I

The author has identified the following significant results. The utility of ERTS-1/high altitude aircraft imagery to detect underground mine hazards is strongly suggested. A 1:250,000 scale mined lands map of the Vincennes Quadrangle, Indiana has been prepared. This map is a prototype for a national mined lands inventory and will be distributed to State and Federal offices.

N73-20376* Texas Instruments, Inc., Dallas.

ERTS-1 IMAGERY USE IN RECONNAISSANCE PROSPECTING: EVALUATION OF COMMERCIAL UTILITY OF ERTS-1 IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM

Interim Report, 29 Aug. 1972 - 28 Feb. 1973
Donald F. Saunders, Principal Investigator, G. L. Thomas, and F. E. Kinsman Mar. 1973 32 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21796)
(E73-10414; NASA-CR-131150) Avail: NTIS HC \$3.75 CSCI 08G

03 OTHER PRIMARY ENERGY SOURCES

The author has identified the following significant results. Five areas in North America (North Slope - Alaska, Superior Province - Canada, Williston Basin - Montana, Colorado, and New Mexico - West Texas) are being studied for discernibility of geological evidence on ERTS-1 imagery. Evidence mapped is compared with known mineral/hydrocarbon accumulations to determine the value of the imagery in commercial exploration programs. Evaluation has proceeded in the New Mexico - Texas area, and to date, results have been better than expected. Clearly discernible structural lineaments in this area are evident on the photographs. Comparison of this evidence with known major mining localities in New Mexico indicates a clear pattern of coincidence between the lineaments and mining localities. In West Texas, lineament and geomorphological evidence obtainable from the photographs define the petroleum-productive Central Basin Platform. Based on evaluation of results in the New Mexico - West Texas area and on cursory results in the other four areas of North America, it is concluded that ERTS-1 imagery will be extremely valuable in defining the regional and local structure in any commercial exploration program.

N73-20391* Bendix Corp., Ann Arbor, Mich.
ECOLOGICAL EFFECTS OF STRIP MINING IN OHIO
Bimonthly Progress Report, 1 Jan. - 1 Mar. 1973
Phillip E. Chase, Principal Investigator 1 Mar. 1973 4 p
(Contract NAS5-21762)
(E73-10430; NASA-CR-131220) Avail: NTIS HC \$3.00 CSCL 081

The author has identified the following significant results. ERTS-1 imagery has identified when reclamation has proved successful, when little lateral extension has occurred in the strip mine, when water has filled an impoundment (4 - 5 acres), and detected narrow contour mines. It has been proven that the CCT contains more information than the imagery received from NASA. A stream is visible in the band 7 digital printout that is not visible in the imagery. Also narrow bodies of water between the high wall and spoils bank and small impoundments (2 - 3 acres) are observed in the digital printout and not in the imagery. Disruption maps (water and bare earth within the mined area) can be made by statistically processing the CCT (decision imagery) or mapping the digital printout with a Bendix digitizer. Reclamation maps will be produced in the near future through decision imagery. There seems little doubt that the mapping of present stripping and the monitoring of the strip mine cycle for changes are practical. Disruption mapping is now an operational capability.

N73-20404* Eason Oil Co., Oklahoma City, Okla.
AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION
Progress Report, Feb. - Mar. 1973
Robert J. Collins, Principal Investigator 9 Apr. 1973 2 p
(Contract NAS5-21735)
(E73-10444; NASA-CR-131239) Avail: NTIS HC \$3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-20413* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
PRELIMINARY EVALUATION OF THE 15 OCTOBER 1972 ERTS-1 IMAGERY OF EAST CENTRAL OHIO (SCENE 1034-15415)
Wayne A. Pettyjohn, Principal Investigator (Ohio State Univ.) Apr. 1973 19 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21762)
(E73-10454; NASA-CR-131254; BSR-3861) Avail: NTIS HC \$3.00 CSCL 08F

The author has identified the following significant results. Results of a general, physical interpretation of ERTS-1 imagery of east central Ohio are presented. Special emphasis is placed upon geologic features, such as linear features and hydrologic

features. Man-made features are included as a matter of interest and image location. The interpretation is compared to available maps of the area and from this an assessment that ERTS-1 is potentially useful for updating and producing geological maps.

N73-20815# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
GROUND SUPPORT EQUIPMENT: LOW POLLUTANT FUELS Final Report, Sep. 1971 - Aug. 1972
Thomas Dale Weikel Sep. 1972 33 p refs
(AD-755151; NAEC-GSED-59) Avail: NTIS CSCL 21/4

Alternate fuels, with an emphasis on liquefied natural gas are briefly reviewed for feasibility of use in aircraft ground support equipment to reduce air pollution. Electricity, steam, and Wankel engines were also investigated. It was concluded that the most practical system is the use of liquefied petroleum gas and catalytic converters on present gasoline engine support equipment.

Author (GRA)

N73-20819# Battelle Columbus Labs., Ohio.
A BRIEF OVERVIEW OF THE ENERGY REQUIREMENTS OF THE DEPARTMENT OF DEFENSE Final Report
R. W. Sullivan, F. A. Creswick, D. E. Erb, M. S. Farkas, and D. D. Moore Aug. 1972 137 p refs Sponsored in part by ARPA, Arlington, Va.
(Contract DAAH01-72-C-0982)
(AD-754824) Avail: NTIS CSCL 21/4

The report documents the results of a brief program to review the magnitude and nature of the energy requirements of the Department of Defense (DoD) and to identify research and development activities or other actions which should be undertaken by the DoD in order to minimize or ameliorate its energy-related problems. Some of the topics include the following: Energy resources (coal, oil, natural gas, uranium, fusion energy, hydrogen energy); Energy consumption and projections for future requirements; Energy problems; and Specific recommendations (Develop domestic sources of substitute liquid petroleum fuel from oil shale and coal, improve the efficiency of piston and turbine engines, develop strategies for military use of hydrogen as an alternate energy source).

GRA

N73-21238* Linguistic Systems, Inc., Cambridge, Mass.
PROBLEMS CONCERNING AUTOMATIC CONNECTION OF AN AEROGENERATOR TO A NETWORK
F. Delafond Washington NASA Apr. 1973 14 p ref Transl. into ENGLISH from the Algerian Report (French Language)
(Contract NASw-2482)
(NASA-TT-F-14873) Avail: NTIS HC \$3.00 CSCL 09C

Modifications were made to the 100 kW Andreau-Enfield experimental aerogenerator, supplying a three-phase network, with the results that: (1) connection to the network was automated and rendered almost instantaneous; (2) propeller starting and stopping were automated; and (3) the amplitude of pumping in high wind was reduced by altering the change-of-pitch speed of the propeller. The machine is functioning problems of power oscillations with wind gusts are still being worked on. It is believed that the aerogenerator is suitable for supplying a large network; for small networks three or more smaller machines would have to work in connection to even out power variations.

Author

N73-21263* Kanner (Leo) Associates, Redwood City, Calif.
PRINCIPLES OF STEEL CONSTRUCTION ENGINEERING IN THE BUILDING AND OPERATION OF WIND DRIVEN POWER PLANTS
Helmut Voigt Washington NASA Apr. 1973 13 p ref Transl. into ENGLISH from Der Stahlbau (West Germany), v. 23, no. 8, Aug. 1954 p 184-188
(Contract NASw-2481)
(NASA-TT-F-14872) Avail: NTIS HC \$3.00 CSCL 13B

The factors which affect the designing of wind-driven power plants are discussed, including purpose and nominal output, wind velocity as a function of height, wind forces as a function of height, and the torques to be expected. Design features of the

03 OTHER PRIMARY ENERGY SOURCES

ZYKLON wind-driven power plants are summarized, and sample calculations are made, based on the ZYKLON-D 30 project. The optimal shaft height for a 30-m wind turbine is found to be 50 m above ground, with a yearly output of 2,125,000 kWh at a cost of 2.68 German pfennigs per kWh. Author

N73-21315* Stanford Univ., Calif. School of Earth Sciences. **STRUCTURAL AND LITHOLOGIC STUDY OF NORTHERN COAST RANGES AND SACRAMENTO VALLEY, CALIFORNIA** Progress Report Ernest I. Rich, Principal Investigator 1 Mar. 1973 4 p ERTS (Contract NAS5-21775) (E73-10478; NASA-CR-131283) Avail: NTIS HC \$3.00 CSCL 08F

The author has identified the following significant results. Analysis of ERTS-1 imagery of the Northern California Coast Ranges has disclosed a potential relation between a heretofore unrecognized fracture system and known deposits of mercury and geothermally active areas in the Coast Range and between oil and gas fields in the Sacramento Valley. Three potentially important systems of linear elements within the Coast Ranges, detected on ERTS-1 imagery, may represent fault systems or zones of shearing because topographic offset and stratigraphic disruption can be seen along one or two of the lineations. One of the systems in subparallel to the San Andreas fault and is confined to the Pacific Coastal Belt. Another set is confined to the central core of the Coast Ranges. The third set of linear features (Valley System) has not heretofore been recognized. Some of the known mercury deposits and geothermally active areas near Clear Lake, in the Coast Ranges, are along the Valley System or at the intersection of the Central and Valley Systems. The plotted locations of some of the oil and gas fields in the Sacramento Valley are associated with the Valley and/or Central Systems. If these relations prove reliable, the ERTS-1 imagery may prove to be an extremely useful exploration tool. A.L.

N73-22284* Alabama Univ., University. **INVESTIGATIONS USING DATA IN ALABAMA** Bimonthly Progress Report, 7 Dec. 1972 - 9 Feb. 1973 Harold R. Henry, Principal Investigator 9 Feb. 1973 31 p ERTS (Contract NAS5-21876) (E73-10509; NASA-CR-131469; BMPR-2) Avail: NTIS HC \$3.75 CSCL 08F

There are no author-identified significant results in this report.

N73-22384 George Washington Univ., Washington, D.C. **THE FEASIBILITY OF DETECTING SUBSURFACE COAL FIRES IN WYOMING AND MONTANA FROM THE GROUND, ON AERIAL PHOTOGRAPHY AND ON SATELLITE IMAGERY** Ph.D. Thesis George A. Rabchevsky 1972 423 p Avail: Univ. Microfilms Order No. 72-25062

An investigation was made to determine the usefulness of ground, aircraft and satellite remote sensing methods for the detection of surface and subsurface coal fires burning in north central Wyoming and southern Montana. Field studies were conducted during the spring, summer and fall seasons and used as back-up information for the analysis of available satellite imagery and aerial multispectral photography, provided by the U.S. Bureau of Mines. Ground observations were the most effective and reliable method for the detection of coal fires. Usefulness of the available aerial fall-season multispectral photography was marginal and the examination of the existing satellite imagery, applicable for the detection of coal fires on the ground, was the least productive. Suggestions and recommendations are presented for future more effective photographic aircraft missions and potential satellite programs. Finally, the various existing methods for the detection of coal fires are summarized in a tabular form and their effectiveness compared. Dissert. Abstr.

N73-23011* Scientific Translation Service, Santa Barbara, Calif. **UTILIZATION OF WIND POWER BY MEANS OF ELEVATED WIND POWER PLANTS**

F. Kelnhenz Washington NASA May 1973 30 p refs Transl. into ENGLISH from Technik (East Berlin), v. 2, no. 12, Dec. 1947 p 517-523 (NASA-TT-F-14903) Avail: NTIS HC \$3.50 CSCL 13B

Exploitation of wind power by power plants at high altitudes is considered. A design of a wind power plant is proposed and its efficiency and economy in the framework of present conditions in Germany is demonstrated. Although costs are higher than for a coal fired steam plant, they compare favorably with hydroelectric power plants and the saving of coal is a great advantage. The erection of an experimental plant is recommended. Author

N73-23414* Texas Instruments, Inc., Dallas. **EVALUATION OF COMMERCIAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM** Progress Report, 1 Mar. - 30 Apr. 1973 Donald F. Saunders, Principal Investigator 8 May 1973 4 p ERTS (Contract NAS5-21796) (E73-10523; NASA-CR-131490) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. The only area that has been analyzed to date is Area 3 where results have already been reported. However, work progressing in Area 1 and 2 seem to indicate a good correlation between lineament zones previously reported, mineralized areas and lineaments currently being picked from ERTS-1 imagery. There also appear to be many lineaments on ERTS-1 imagery in these areas which have not been reported in any other literature.

N73-24268* Scientific Translation Service, Santa Barbara, Calif. **THE FIRST AERODYNAMIC THREE-PHASE ELECTRIC POWER PLANT IN BALAKLAWA** W. R. Sectorov Washington NASA Jun. 1973 13 p Transl. into ENGLISH from L'Elettrotecnica (Italy), v. 21, no. 23-24, Aug. 1934 p 538-542 (Contract NASw-2483) (NASA-TT-F-14933) Avail: NTIS HC \$3.00 CSCL 10B

The assembly and functional characteristics of an experimental 100 kW power plant built in Crimea are described. The operating data obtained during the first two years of operation are reported. Author

N73-24432* Bureau of Mines, Denver, Colo. **SATELLITE MONITORING OF OPEN PIT MINING OPERATIONS** William C. Henkes 1971 32 p (BM-IC-8530) Avail: SOD \$0.35

The relationships between areal extent, development, volume of waste dumps, and the pits of open pit mining operations as observed on the ground and on photographs taken from satellites are investigated. The ultimate goal is the establishment of criteria to evaluate repetitive space imagery in quantifiable terms. These criteria would aid the Bureau of Mines in discharging its responsibilities in the fields of solid waste disposal, reclamation of mine workings, and mineral resources inventory. The study serves as a basis for additional experiments using remote sensing techniques in the minerals industry. Author

N73-25338* Bendix Corp., Ann Arbor, Mich. **DETERMINE UTILITY OF ERTS-1 TO DETECT AND MONITOR AREA STRIP MINING AND RECLAMATION** Interim Report, Nov. 1972 - Apr. 1973 Phillip E. Chase, Principal Investigator and Larry Reed May 1973 48 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21782) (E73-10641; NASA-CR-132100) Avail: NTIS \$4.50 CSCL 08I

There are no author-identified significant results in this report.

03 OTHER PRIMARY ENERGY SOURCES

N73-25342*# Eason Oil Co., Oklahoma City, Okla.
AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION
 Interim Report, Dec. 1972 - May 1973
 Robert J. Collins, Principal Investigator, F. P. McCown, L. P. Stonis, and Gerald Petzel Jun. 1973 18 p ERTS
 (Contract NAS5-21735)
 (E73-10646; NASA-CR-132980) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. ERTS-1 imagery seems to be good to excellent for reconnaissance level investigations of large sedimentary basins such as the Anadarko Basin. Many lithologic boundaries, and geomorphic features, and linear features inferred to be indicative of geologic structure are visible in the imagery. This imagery in conjunction with high altitude photography seems to be useful as a tool for intermediate level geologic exploration. Several types of crudely circular anomalous features, such as geomorphic/structural anomalies, hazy areas and tonal anomalies, are identifiable in the imagery. There seems to be a strong correlation between the geomorphic/structural and hazy anomalies and known structurally controlled oil and gas fields. The features recognizable on ERTS-1 imagery and their ease of recognition vary from area to area even in imagery acquired at the same time under essentially uniform atmospheric conditions. Repeated coverage is exceedingly valuable in geologic applications. One time complete coverage even for the various seasons does not reveal all the features that ERTS-1 can reveal.

N73-25357*# Tennessee Univ., Knoxville. Dept. of Geography.
GEOGRAPHIC ANALYSIS OF LANDSCAPE CHANGE FROM ERTS-1 IMAGERY Progress Report
 John B. Rehder, Principal Investigator Jun. 1973 26 p ref
 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
 (Contract NAS5-21726)
 (E73-10661; NASA-CR-132170) Avail: NTIS HC \$3.50 CSCL 08F

There are no author-identified significant results in this report.

N73-25386*# Tennessee Univ., Knoxville. Dept. of Geography.
GEOGRAPHIC ANALYSIS OF LANDSCAPE CHANGE FROM ERTS-1 IMAGERY
 John B. Rehder, Principal Investigator Jun. 1973. 1 p ERTS
 (Contract NAS5-21726)
 (E73-10694; NASA-CR-132998) Avail: NTIS HC \$3.00 CSCL 08F

The author has identified the following significant results. Data from low altitude flights and ground truth observations confirm the existence of significant strip mining activity at the Cumberland Plateau, Tennessee Test Site. A map (1:120,000) depicting landscape changes associated with strip mining on the Cumberland Plateau has been completed. The map was prepared from NASA generated RB-57 imagery for April 1972 and ERTS imagery for October 1972. A second map shows the generalized forest cover for the state of Tennessee. The data were derived entirely from five ERTS-1 images and reduced to an original map scale of 1:2.4 million. The most significant discovery concerns the detection, identification, and mapping of plowed fields in northern Alabama, northern Georgia, and southeastern Tennessee. In an April ERTS observation, plowed ground and bare soil surfaces were easily detected and mapped from MSS band 5.

N73-25392*# Texas Instruments, Inc., Dallas.
EVALUATION OF COMMERCIAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM Progress Report, 1 May - 30 Jun. 1973

Donald F. Saunders, Principal Investigator 9 Jul. 1973 5 p ERTS
 (Contract NAS5-21796)
 (E73-10700; NASA-CR-133013) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. In areas 2 and 3 (Colorado and New Mexico - Texas) continuing correlations are observed between lineaments selected from the ERTS imagery and known fault and fracture zones. There continues to be a correlation between lineament intersectional areas and known mining areas. Initial contacts with mining and/or petroleum companies regarding the use of ERTS-1 imagery as an interpreted medium for guiding reconnaissance operations seems to indicate that the technology and economics will be commercially acceptable for initial investigatory investments.

N73-25411# Bureau of Mines, Washington, D.C.
MINERALS YEARBOOK, 1970. VOLUME 2: AREA REPORTS, DOMESTIC Annual Statistical Report
 1972 787 p refs
 (PB-214329/5; BM-MYB-170-Vol-2) Avail: NTIS MF \$1.45; SOD HC \$6.75 as 128.37:97 CSCL 08I

Volume II, Area Reports: Domestic, contains chapters covering the mineral industry of each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, the Commonwealth of Puerto Rico, and the Canal Zone. This volume also has a statistical summary chapter and a chapter on employment and injuries.
 Author (GRA)

N73-26337*# Wolf Research and Development Corp., Pocomoke City, Md.
APPLICABILITY OF SATELLITE REMOTE SENSING FOR MONITORING SURFACE MINING ACTIVITIES Quarterly Progress Report, 8 Mar. - 8 Jun. 1973
 R. L. Brooks and J. D. Pennewell 8 Jun. 1973 7 p
 (Contract NAS9-13310)
 (E73-10731; NASA-CR-133075; QPR-1) Avail: NTIS HC \$3.00 CSCL 08I

There are no author-identified significant results in this report.

N73-27252*# Indiana Geological Survey, Bloomington.
APPLICATION OF ERTS-A IMAGERY TO FRACTURE RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, Jan. - Jul. 1973
 Charles E. Wier, Frank J. Wobber, Principal Investigators (Earth Satellite Corp., Washington, D. C.), R. V. Amato (Earth Satellite Corp., Washington, D. C.), and O. R. Russell Jul. 1973 79 p refs
 Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
 (Contract NAS5-21795)
 (E73-10776; NASA-CR-133143) Avail: NTIS HC \$6.00 CSCL 08I

The author has identified the following significant results. New fracture detail of Indiana has been observed and mapped from ERTS-1 imagery. Studies so far indicate a close relationship between the directions of fracture traces mapped from the imagery, fractures measured on bedrock outcrops, and fractures measured in the underground mines. A seasonal dependence of satellite fracture detection has been established based on vegetational tone differences and solar illumination angle. Numerous image enhancement techniques were tested for improved fracture detection and it was demonstrated that for glacial drift-covered areas of Indiana these techniques were of little value. Manual analysis procedures have, however, been successful. Previously unknown areas of mine subsidence have been observed and field checked. Subsidence-prone areas which are readily detectable on ERTS-1 imagery have been established. A prototype National Mined Lands inventory photomap was made to coincide with the Vincennes 1:250,000 map sheet and distributed to members of Congress and various governmental and mining industry officials. A fracture-lineament map and a mine hazards prediction map are being prepared to classify the test area by the relative potential of roof-fall hazards in future underground mining.

N73-27277* Earth Satellite Corp., Washington, D.C.
APPLICATION OF EREP IMAGERY TO FRACTURE RELATED MINE SAFETY HAZARDS AND ENVIRONMENTAL PROBLEMS IN MINING Quarterly Progress Report
 Charles E. Wier, Frank J. Wobber, Principal Investigators, Roger V. Amato, and Orville R. Russell 17 Jul. 1973 3 p Prepared for Ind. Geol. Surv. EREP
 (Contract NAS9-13358)
 (E73-10802; NASA-CR-133209; QPR-1) Avail: NTIS HC \$3.00 CSCL 081

There are no author-identified significant results in this report.

N73-27324# Joint Publications Research Service, Arlington, Va.

DEEP-SEATED HEAT FROM THE EARTH

I. M. Dvorov 12 Jul. 1973 148 p refs Transl. into ENGLISH from the book "Glubinnoye Teplo Zemli" Moscow, Nauka, 1972 p 9-104 and 141-205

(JPRS-59496) Avail: NTIS HC \$9.50

Basic scientific trends are discussed, such as: regional distribution and conditions of geothermal field formation in a zone accessible to direct measurements; development and improvement of the equipment and procedures in geothermal observations; deep-seated thermal processes; and social-economic utilization of earth's heat. Author

N73-27369# Arizona Univ., Tucson. Office of Arid Lands Studies.

EXPLORATION AND EXPLOITATION OF GEOTHERMAL RESOURCES IN ARID AND SEMIARID LANDS: A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY
 Arid Lands Resource Information Paper No. 2

1973 125 p

(Contract DI-14-31-0001-3729)

(PB-218930/8; W73-07420; OWRR-W-144(2)) Avail: NTIS HC \$5.45 CSCL 08G

Contemporary techniques for exploration of geothermal resources are outlined, with particular emphasis on the western U.S. as typical of problems encountered in arid and semiarid lands. These include field reconnaissance, infrared aerial reconnaissance, photogeologic mapping, drilling, geochemical analysis of ground water, application of fluid dynamics to natural steam systems, electrical prospecting, seismic, gravity, and magnetic surveys. Environmental impacts, including noise, odors, subsidence, and legal problems involving developmental regulations, are reviewed. (Author Modified Abstract)

N73-27642# Bureau of Mines, Bartlesville, Okla. Energy Research Center.

THE ASSOCIATION OF AUTOMOTIVE FUEL COMPOSITION WITH EXHAUST REACTIVITY

Basil Dimitriadis, B. H. Eccleston, G. P. Sturm, Jr., and C. J. Reible 1973 61 p refs Sponsored in part by EPA

(BM-R1-7768) Avail: NTIS HC \$4.75

The association of automotive fuel composition with exhaust reactivity was studied in an experimental program that involved testing with different automotive engines and with gasoline of varied composition. Results showed clearly the exhaust reactivity to increase with increasing levels of polyalkylbenzenes in the fuel. No other systematic patterns of high significance were detected in the association of exhaust reactivity with several broadly defined groups of fuel components. Classification of fuel components in terms of the paraffins-olefins-aromatics groups does not meet the latter requirements. For appropriate classification of fuel components more information is needed on the combustion of hydrocarbons in the multicylinder internal combustion engine. Statistical analysis of the mass emissions data showed significant car and fuel effects on hydrocarbon, carbon monoxide, nitric oxide, total aldehydes, and formaldehyde emission levels and on total photochemical reactivity. Car-fuel interactions were not significant at the 90-pct level. Correlations were found between mass emission parameters and fuel composition. Author

N73-28249* Stanford Univ., Calif. Dept. of Geology.

RELATION OF ERTS-1 DETECTED GEOLOGIC STRUCTURE TO KNOWN ECONOMIC ORE DEPOSITS

Ernest I. Rich /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 395-402 refs Original Contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Paper-G18) CSCL 08G

A preliminary analysis of ERTS-1 imagery of the Northern Coast Ranges and Sacramento Valley, California, has disclosed a potentially important fracture system which may be one of the controlling factors in the location of known mercury deposits in the Coast Ranges and which appears to be associated with some of the oil and gas fields within the Sacramento Valley. Recognition of this fracture system may prove to be an extremely useful exploration tool, hence careful analysis of subsequent ERTS imagery might delineate areas for field evaluation. Author

N73-28261* Texas Instruments, Inc., Dallas.

EVALUATION OF COMMERCIAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM

Donald F. Saunders and Gilbert E. Thomas /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 523-530 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Paper-G30) CSCL 08G

Five areas in North America (North Slope-Alaska, Superior Province-Canada, Williston Basin-Montana, Colorado and New Mexico-West Texas) are being studied for discernibility of geological evidence on ERTS-1 imagery. Evidence mapped is compared with known mineral/hydrocarbon accumulations to determine the value of the imagery in commercial exploration programs. Evaluation has proceeded in the New Mexico-West Texas area while awaiting imagery in the other areas. To date, results have been better than expected. Clearly discernible structural lineaments in New Mexico-West Texas are evident on the photographs. Comparison of this evidence with known major mining localities in New Mexico indicates a clear pattern of coincidence between the lineaments and mining localities. In West Texas, lineament and geomorphological evidence obtainable from the photographs define the petroleum-productive Central Basin Platform. Based on evaluation results in the New Mexico-West Texas area and on cursory results in the other four areas of North America, ERTS-1 imagery will be extremely valuable in defining the regional and local structure in any commercial exploration program. Author

N73-28266* Bendix Corp., Ann Arbor, Mich.

ERTS-1 INVESTIGATION OF ECOLOGICAL EFFECTS OF STRIP MINING IN EASTERN OHIO

Philip E. Chase and Wayne Pettyjohn (Ohio State Univ.) /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B. 1973 p 561-568 refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Paper-E2) CSCL 081

Evidence is presented of ERTS capability to detect, map and monitor the effects of strip mining. Both enlarge ERTS imagery and statistically processed outline maps and imagery of stripped earth and standing water are compared to aerial photos of a strip mine near Coshocton, Ohio. The outline maps and decision imagery are at present limited to forming a disruption map of recently mined and unreclaimed earth and the resultant standing water within the mined area. It is planned to prepare a map of the reclaimed areas (reclamation map) within the stripped area and to detect and identify ecological effects such as vegetation kills and stream sedimentation external to the stripped areas. Author

03 OTHER PRIMARY ENERGY SOURCES

N73-28267* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

THE USE OF ERTS-1 MSS DATA FOR MAPPING STRIP MINES AND ACID MINE DRAINAGE IN PENNSYLVANIA
S. S. Alexander, J. Dein, and D. P. Gold /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 569-575 refs erts (For availability see N73-28207 19-13)
(Paper-E3) CSCL 081

Digital processing of ERTS-1 MSS data for areas around the west branch of the Susquehanna River permits identification of stripped areas including ones that are not discernible from visual analysis of ERTS imagery. Underflight data and ground-based observations are used for ground-truth and as a basis for designing more refined operators to make sub-classifications of stripped areas, particularly with regard to manifestations of acid mine drainage; because of associated diagnostic effects on vegetation, seasonal changes in classification criteria are being documented as repeated, cloud-free ERTS-1 coverage of the same area becomes available. Preliminary results indicate that ERTS data can be used to monitor not only the total extent of stripping in given areas but also the effectiveness of reclamation and pollution abatement procedures. Author

N73-28277* American Univ., Washington, D.C. Dept. of Biology.

DIGITAL ANALYSIS OF POTOMAC RIVER BASIN ERTS IMAGERY: SEDIMENTATION LEVELS AT THE POTOMAC-ANACOSTIA CONFLUENCE AND STRIP MINING IN ALLEGHENY COUNTY, MARYLAND

J. S. Schubert and N. H. MacLeod /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 659-664 ERTS

(Paper-E13) CSCL 08H

Two simple algorithms for classification of sedimentation levels in water and for delineation of active strip mines are in use as part of the development of a more general resource management information system. ERTS MSS CCT's are processed so that each pixel in each channel is geographically referenced and can be accessed individually during whole frame, multi-channel analysis or partial frame analysis. The sedimentation analysis clearly separates classes representing the turbid Anacostia water, the less disturbed Potomac (really), and mud flats resulting from effluent of a major sewage treatment plant. Mud flats of organic or mineral origin are easily distinguished. Author

N73-28319* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION

F. Y. Borden, D. N. Thompson, and H. M. Lachowski /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 1067-1074 refs ERTS

(Paper-L24) CSCL 08G

ERTS-1 MSS data covering parts of Pennsylvania's southern and eastern middle anthracite coal fields were studied to determine how well accumulations of coal refuse could be identified and mapped by computer analysis and processing. Spectral signatures of coal refuse targets were similar to water, but had higher reflectances in all channels. Relative reflectances were in the order $4 > 5 > \text{or} = 6 > 7$. Although no underflight photography was at hand to judge mapping success, correlation was made, with 1:24,000 scale U.S.G.S. maps dated 1947 and 1948. Coal refuse targets correlated well with existing maps. Author

N73-28361* Ohio Dept. of Economic and Community Development, Columbus.

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO

David C. Sweet, Terry L. Wells, and George E. Wukelic (Battelle Columbus Labs., Ohio) /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 1459-1466 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

(Paper-R3) CSCL 08F

Initial experimental analysis of ERTS-1 imagery has demonstrated that remote sensing from space is a means of delineating and inventorying Ohio's strip-mined areas, detecting power plant smoke plumes, and proving the data necessary for periodically compiling land use maps for the entire state. The nature and extent of these problems throughout Ohio, how ERTS data can contribute to their solution, and estimates of the long term significance of these initial findings to overall resource management interests in Ohio are summarized. Author

N73-28372* Ohio Univ., Athens. Dept. of Geology.

MAPPING OF SOIL BANKS USING ERTS-1 PICTURES

Moid U. Ahmad, David A. Kantner, and John W. Antalovich (Kucera and Assoc., Inc., Mentor, Ohio) /In NASA. Goddard Space Flight Center Symp. on Significant Results obtained from the ERTS-1, Vol. 1, Sect. A and B 1973 p 1575-1582 Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS

CSCL 08B

Earth Resources Technology Satellite (ERTS-1) pictures of different wavelengths (MSS 4,5,6,7) were used in the study of two strip mine areas in southeastern Ohio. The first area was near Piedmont Lake and the second area was near New Lexington. Prints were examined under a binocular microscope and the gray tone was correlated with the actual ground conditions at several sites. For the New Lexington area, color infrared pictures taken at an elevation of 18,000 feet were also used for correlation with the ERTS-1 imagery. The results indicate that MSS 5 and 7 are most useful in defining the stripped land and show that the hydrological and soil characteristics are remarkably different than the surrounding lands. Author

N73-28421*# Tennessee Univ., Knoxville. Dept. of Geography.

APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE IN EASTERN TENNESSEE

John B. Rehder, Principal Investigator 31 Jul. 1973 13 p refs Proposed for presentation at Symp. on Management and Utilization of Remote Sensing Data, Sioux Falls, S. D., 29 Oct. - 2 Nov. 1973; sponsored by Am. Soc. of Photogrammetry Submitted for publication Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS (Contract NAS5-21726)

(E73-10843; NASA-CR-133422) Avail: NTIS HC \$3.00 CSCL 08F

The author has identified the following significant results. The analysis of landscape change in eastern Tennessee from ERTS-1 data is being derived from three avenues of experimentation and analysis: (1) a multi-stage sampling procedure utilizing ground and aircraft imagery for ground truth and control; (2) a densitometric and computer analytical experiment for the analysis of gray tone signatures and comparisons for landscape change detection and monitoring; and (3) an ERTS image enhancement procedure for the detection and analysis of photomorphic regions. Significant results include: maps of strip mining changes and forest inventory, watershed identification and delimitation, and agricultural regions derived from spring plowing patterns appearing on the ERTS-1 imagery.

N73-29004*# Scientific Translation Service, Santa Barbara, Calif.

EXPERIMENTAL AEROGENERATOR TYPE BEST - ROMANI.

DESCRIPTION, ASSEMBLY, TEST PROGRAM

Washington NASA Aug. 1973 50 p Transl. into ENGLISH of the publ. "Aerogenerateur Experimental Type BEST - Romani description - Montage Programme d'Essai" Paris, Elec. de France, 1958 54 p

(Contract NASw-2483)

(NASA-TT-F-15037) Avail: NTIS HC \$4.50 CSCL 10A

The characteristics of a propeller-driven electrical generating machine using wind power are presented. The construction of an installation for the equipment is described. The measurements conducted during the performance tests are analyzed. Author

**N73-29008*# Kanner (Leo) Associates, Redwood City, Calif.
OPERATING EXPERIENCE OBTAINED WITH A 100 kW
WIND POWER PLANT**

U. Huettner Washington NASA Aug. 1973 27 p refs Transl. into ENGLISH from Brennstoff-Waerme-Kraft (Duesseldorf), v. 16, 1964 P333-340

(Contract NASw-2481)

(NASA-TT-F-15068) Avail: NTIS HC \$3.50 CSCL 10A

An excerpt is given from the report on experiments and experience associated with the wind power plant and covering design data and those aspects which were decisive in its layout and the type of regulating provisions used, as well as results of the detailed operational tests. The regulating system and the automatic cut-in provisions permit the system to be connected automatically to the public power supply network on the basis of a specific program. The various types of wind conditions considered in designing the power plant are described. Author

N73-29009*# Scientific Translation Service, Santa Barbara, Calif.

**THE DEVELOPMENT OF WIND POWER INSTALLATIONS
FOR ELECTRICAL POWER GENERATION IN GERMANY**

Ulrich Huettner Washington NASA Aug. 1973 32 p refs Transl. into ENGLISH from Z. Brennstoff-Waerme-Kraft (Duesseldorf), v. 6, no. 7, 1954 p 270-278

(Contract NASw-2483)

(NASA-TT-F-15050) Avail: NTIS HC \$3.75 CSCL 10A

The development of installations for reducing electrical energy from wind energy is beginning in Germany. The wind tower generation installations built by German firms have a wheel area of between 50 to 250 square meters for installed power levels between 3 and 50 kW. In the last 30 years, there has been a tendency to increase the design rotation rate coefficient from 2-4 to a level between 8-16. At the present time, there are reliable installations with nominal power levels between 3 and 22 kW. Successful Danish, American, Russian, and German experiments over prolonged time periods proved that it is possible to operate wind power generation units in parallel with public high-voltage installations without any difficulty. This means that wind energy is now available to satisfy the energy requirement which is continuously increasing all over the world. A rough calculation shows that the energy capacity of the ocean of air is unlimited. Author

**N73-29225*# Geological Survey, Washington, D.C. EROS
Program Office.**

**SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE
SENSING OF ICELAND Special Report No. 1**

Richard S. Williams, Jr. and Guomundur Palmason (Natl. Energy Authority, Reykjavik) 1 Aug. 1973 5 p refs Sponsored by NASA ERTS

(E73-10874; NASA-CR-133491) Avail: NTIS HC \$3.00 CSCL 08L

There are no author-identified significant results in this report.

**N73-29367# Interior Dept., Washington, D.C.
ENVIRONMENTAL STATEMENT FOR THE PROPOSED
PROTOTYPE OIL-SHALE LEASING PROGRAM. VOLUME 1:**

**DESCRIPTIONS OF THE REGIONS AND POTENTIAL
ENVIRONMENTAL IMPACTS**

Sep. 1972 501 p refs

(EIS-AA-72-5242-D-1-Vol-1) Avail: NTIS HC \$27.25

The regional environmental impact expected from shale development on private and public lands is examined. A companion document reviews the specific impacts associated with the development of six leases on public lands if the Department of the Interior's proposed prototype oil shale leasing program is implemented. A current state-of-the-art assessment of the technology that may be employed in oil shale development is provided. Included in this assessment are methods of processing; technology related to the management of solid wastes and wastes within the working areas; monitoring methods; and a guide to current research that pertains to the environmental aspects of oil shale development. The regional environmental impact of oil shale development to a maximum cumulative production of 1 million barrels per day by 1985 is described. Author

N73-30311*# Earth Satellite Corp., Washington, D.C. Geosciences and Environmental Applications Div.

**STUDY OF APPLICATION OF ERTS-A IMAGERY TO
FRACTURE-RELATED MINE SAFETY HAZARDS IN THE
COAL MINING INDUSTRY Progress Report, 1 Jul. - 1 Sep.
1973**

Charles E. Wier (Indiana Geological Survey), Frank J. Wobber, Principal Investigators, Orville R. Russell, Roger V. Amato, and Thomas Lashendok 10 Sep. 1973 4 p ERTS

(Contract NAS5-21795)

(E73-10970; NASA-CR-133749) Avail: NTIS HC \$3.00 CSCL 08I

The author has identified the following significant results. The Kings Station Mine in Gibson County, Indiana has experienced considerable roof fall problems. Detailed fracture mapping of the mine area was done with ERTS-1 and aircraft imagery, and a prediction map of roof problem areas was produced in advance of a visit. The visit to the mine and discussions with the operator indicated that of four zones mapped as potential problem areas, three coincided with areas of excessive roof fall. This positive correlation of 75% lends confidence to the validity of the technique being applied in the investigation. The mine officials expressed an interest in the project and are anxious to see the final product maps which are forthcoming.

**N73-30335# Bureau of Mines, Bartlesville, Okla. Energy
Research Center.**

BUREAU OF MINES ENERGY PROGRAM, 1972

Bill Linville and John D. Spencer 1973 116 p

(BM-IC-8612) Avail: NTIS HC \$8.00

Technologies for improving the production and utilization of petroleum, natural gas, and coal were investigated. Topics included are: oil recovery from tar sands, energy relationships, environmental activities, coal storage, preparation and transportation, and in situ processing. The investigations of clean fluid fuels from coal, gas purification, reservoir properties, fly-ash utilization, and coal mine health and safety are also reported. T.M.R.

**N73-30976*# Kanner (Leo) Associates, Redwood City, Calif.
PROJECT OF WIND MOTOR WITH AERODYNAMIC
TRANSMISSION FOR CAPACITIES OF 100 kw TO
3000 kw**

N. V. Kravoskiy Washington NASA Sep. 1973 21 p refs Transl. into ENGLISH from Izv. Otd. Tekh. Nauk, Akad. Nauk SSSR (USSR), no. 5, 1939 p 65-77

(Contract NASw-2481)

(NASA-TT-F-15131) Avail: NTIS HC \$3.25 CSCL 10A

To reduce excessive weight requirements in the design of a 100-3000 kw capacity wind motor, aerodynamic transmission is employed. Aerodynamic transmission involves mounting secondary small windmills at the ends of the main wheel blades of the wind motor. The secondary small windmills operate in a high-velocity relative stream of 40-70 m/sec and can produce energy directly from the wind with the windmills turning at 500 or more rpm, with an efficiency of 80 percent or higher. Author

03 OTHER PRIMARY ENERGY SOURCES

N73-31284* State of Ohio Dept. of Development, Columbus. **RELEVANCE OF ERTS TO THE STATE OF OHIO** Progress Report, Jul. - Aug. 1973
David C. Sweet, Principal Investigator Aug. 1973 33 p ref
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21782)
(E73-10987; NASA-CR-133786) Avail: NTIS HC \$3.75 CSCL 08F

The author has identified the following significant results. A significant result was the fabrication of an image transfer and comparison device. To avoid problems and high costs encountered in manual drafting methods, Battelle staff members have fabricated an inexpensive, yet effective, technique for transferring ERTS-1 analysis displays from the Spatial Data 32-Color Viewer to maps and/or aircraft imagery. In brief, the image transfer-comparison device consists of a 2-way mirror which functions similar to a zoom transfer scope. However, the device permits multiuser viewing and real time photographic recording (35-mm and Polaroid) of enhanced ERTS-1 imagery superimposed over maps and aircraft photography. Thirty-five mm, 70 mm, and 4 in. x 5 in. photographs are taken of 80% of the TV screen of the Spatial Data Density Slicing Viewer. The resulting black and white and color imagery is then used in transparent overlays, viewgraphs, 35-mm and 70-mm transparencies, and paper prints for reports and publications. Annotations can be added on the TV screen or on the finished product.

N73-31337* Wolf Research and Development Corp., Pocomoke City, Md.

APPLICABILITY OF SATELLITE REMOTE SENSING FOR MONITORING SURFACE MINING ACTIVITIES Quarterly Progress Report, 8 Jun. - 8 Sep. 1973

R. L. Brooks, Principal Investigator and J. D. Pannewell 24 Sep. 1973 7 p EREP

(Contract NAS9-13310)

(E73-11033; NASA-CR-133865; QPR-2) Avail: NTIS HC \$3.00 CSCL 08I

There are no author-identified significant results in this report.

N73-31338* Indiana Geological Survey, Bloomington. **STUDY OF APPLICATION OF ERTS-A IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY** Significant Results Report
Charles Wier, Frank J. Wobber (Earth Satellite Corp., Washington, D. C.), Orville R. Russell, and Kenneth R. Martin, Principal Investigators 28 Sep. 1973 1 p ERTS
(Contract NAS5-21795)
(E73-11034; NASA-CR-133866) Avail: NTIS HC \$3.00 CSCL 08I

The author has identified the following significant results. Mined land reclamation analysis procedures developed within the Indiana portion of the Illinois Coal Basin were independently tested in Ohio utilizing 1:80,000 scale enlargements of ERTS-1 image 1029-15361-7 (dated August 21, 1972). An area in Belmont County was selected for analysis due to the extensive surface mining and the different degrees of reclamation occurring in this area. Contour mining in this area provided the opportunity to extend techniques developed for analysis of relatively flat mining areas in Indiana to areas of rolling topography in Ohio. The analysts had no previous experience in the area. Field investigations largely confirmed office analysis results although in a few areas estimates of vegetation percentages were found to be too high. In one area this error approximated 25%. These results suggest that systematic ERTS-1 analysis in combination with selective field sampling can provide reliable vegetation percentage estimates in excess of 25% accuracy with minimum equipment investment and training. The utility of ERTS-1 for practical and reasonably reliable update of mined lands information for groups with budget limitations is suggested. Many states can benefit from low cost updates using ERTS-1 imagery from public sources.

N73-31339* Geological Survey, Menlo Park, Calif. **IDENTIFICATION OF GEOSTRUCTURES OF CONTINENTAL CRUST, PARTICULARLY AS THEY RELATE TO MINERAL-RESOURCE EVALUATION** Progress Report, 1 Jan. - 30 Jun. 1973

George Gryc, Principal Investigator and Ernest H. Lathram 30 Jun. 1973 10 p refs ERTS

(NASA Order S-70243-AG-1)

(E73-11035; NASA-CR-133881) Avail: NTIS HC \$3.00 CSCL 08G

The author has identified the following significant results. Analysis of lineated lakes in the Umiat, Alaska area and comparison with known geology, gravity, and magnetic data in the area suggest concealed structures exist at depth, possibly at or near basement, which may represent targets for petroleum exploration. Compilation of reconnaissance geologic data on 1:250,000 scale enlargements of ERTS-1 images near Corwin reveal structural and stratigraphic anomalies that suggest the Cretaceous sequence is less thick than supposed and is repeated in a series of plates superimposed by flat thrust faults. The structural style differs from that in coeval strata to the north-east, across the northwest-trending linear zone separating differing tectonic styles in older strata noted earlier. The regional extension of a fault known locally in the McCarthy area has been recognized; this fault appears to form the boundary of a significant terrane of mid-Paleozoic metamorphic rocks. ERTS-1 images are being used operationally, at 1:1,000,000 scale in the compilation of regional geologic maps, and at 1:250,000 scale in field mapping in the Brooks Range, in the study of faults in seismically active southern Alaska, in field-checking interpretations previously made from ERTS-1 imagery, and orthophoto base maps for geologic maps.

N73-32229* Eason Oil Co., Oklahoma City, Okla. **AN EVALUATION OF THE SUITABILITY OF ERTS DATA FOR THE PURPOSES OF PETROLEUM EXPLORATION** Progress Report, Jun. - Jul. 1973

Robert J. Collins, Principal Investigator 1 Oct. 1973 2 p ERTS

(Contract NAS5-21735)

(E73-11053; NASA-CR-133934) Avail: NTIS HC \$3.00 CSCL 08G

There are no author-identified significant results in this report.

N73-32300* World Meteorological Organization, Geneva (Switzerland).

ENVIRONMENTAL FACTORS IN OPERATIONS TO COMBAT OIL SPILLS

L. Otto 1973 32 p refs

(WMO-359; MAS-9) Avail: NTIS HC \$3.75

To combat oil spills effectively, knowledge of the rate and direction of spill movement is required, the latter being determined by winds, waves, and currents, as well as by the physical and chemical properties of oil and water. These aspects are discussed, and factors to be taken into account in developing forecast procedures are also indicated. ESRO

N73-33264* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources (ORSER).

MAPPING OF ANTHRACITE REFUSE Interim Report

George J. McMurtry, Gary W. Petersen, Principal Investigators, D. N. Thompson, and F. Y. Borden May 1973 18 p refs ERTS

(Contract NAS5-23133)

(E73-11107; NASA-CR-135575; ORSER-SSEL-TR-20-73) Avail: NTIS HC \$3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-33269* Pennsylvania State Univ., University Park. Space Science and Engineering Lab.

ACID MINE DRAINAGE AND STRIP MINES Interim Report

George J. McMurtry, Gary W. Petersen, Principal Investigators,
S. S. Alexander, and J. L. Dein May 1973 8 p ref ERTS
(Contract NAS5-23133)
(E73-11112; NASA-CR-135581; ORSER-SSEL-TR-23-73) Avail:
NTIS HC \$3.00 CSCL 081

There are no author-identified significant results in this report.

N73-33921# RAND Corp., Santa Monica, Calif.

TRANSPORTATION AND ENERGY

W. E. Mooz Jun. 1973 23 p refs Presented at the 1st
Annual Illinois Energy Conf., Chicago, 13-15 Jun. 1973
(Grant NSF GI-44)

(P-5025) Avail: NTIS HC \$3.25 CSCL 21D

The use of energy in the transportation sector is discussed. Transportation in the United States presently uses about 25 percent of the total annual energy budget, and the use of energy in the sector is increasing at an average annual rate of about 4 percent per year. Over 95 percent of this energy is supplied by petroleum fuels, and the biggest users are motor vehicles. Differences in modal efficiencies are shown, with motor vehicles and aircraft the least efficient energy users. The growth in energy use by transportation is shown to be due to increasing modal energy intensiveness, shifts in traffic from low intensiveness modes to high intensiveness modes, and increasing per capita use of transportation. One may expect to see more small cars, shifts from air and highway modes to buses, trains, and pipelines, and changes in personal transportation habits.

Author

04 SECONDARY ENERGY SOURCES

Includes hydrogen, methanol, ammonia, synthetic fuels, coal gasification and conversion; bioconversion of organic materials.

A69-21039

COLD HYDROGEN AND BASIC ELECTROLYTE CELLS AT THE RESEARCH CENTER OF THE CGE [LES PILES FROIDES A HYDROGENE ET A ELECTROLYTE BASIQUE AU CENTRE DE RECHERCHES DE LA C. G. E.]. Claude Edon (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Marcoussis, Essonne, France). IN: ELECTROCHEMICAL GENERATORS FOR SPACE APPLICATIONS; CENTRE NATIONAL D'ETUDES SPATIALES, INTERNATIONAL CONVENTION, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS [LES GENERATEURS ELECTROCHIMIQUES POUR APPLICATIONS SPATIALES; CENTRE NATIONAL D'ETUDES SPATIALES, COLLOQUE INTERNATIONAL, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS]. Paris, Dunod Editeur, 1968, p. 57-70. In French.

Discussion of the development of fuel cells based on a study of the composite subsystems - e.g., single cell batteries, reagent chambers, and auxiliary control systems. The development of a cold hydrogen and basic electrolyte cell is described on the basis of the following parameters: (1) anatomy, weight, and reliability of the batteries, (2) low-power cells and operation in air, (3) power of the cell and regulation of the electrolyte concentration, and (4) reliability, output, and weight of the auxiliary control systems.

M. G.

A69-43725

ACTIVE COOLING OF A HYDROGEN-FUELED SCRAMJET ENGINE.

L. L. Pagel and W. R. Warmbold (McDonnell Douglas Corp., McDonnell Aircraft Co., St. Louis, Mo.). (*American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 5th, Philadelphia, Pa., Oct. 21-24, 1968, Paper 68-1091.*)

Journal of Aircraft, vol. 6, Sept.-Oct. 1969, p. 472-474.

Analytical studies were performed to determine engine cooling requirements for a scramjet powered, high-altitude cruise aircraft. A comparison of active cooling concepts resulted in the selection of a regenerative system using superalloy heat exchangers and the hydrogen fuel as coolant. This approach resulted in efficient operation (i.e., equivalence ratios of less than one) at flight speeds of Mach 12 or greater. Internal aerodynamic heating rates were predicted by the reference enthalpy turbulent heating correlation and increased locally to account for shock/boundary layer interaction effects. Coolant side heat transfer analyses were performed to determine near optimum heat exchanger core geometry. Sensitivity studies established the relationship between engine cooling requirements and key parameters for a representative aircraft.

(Author)

A70-31851 *

Hypersonic aircraft technology and applications. A. J. Eggers, Jr., N. B. Cohen (NASA, Washington, D.C.), and R. H. Petersen (NASA, Ames Research Center, Moffett Field, Calif.). *Astronautics and Aeronautics*, vol. 8, June 1970, p. 30-41. 31 refs.

Discussion of hypersonic aircraft technology giving particular attention to a long-range transport and to a reusable launch vehicle. The study of hypersonic commercial transports indicates that hypersonic aircraft cruising at about Mach 6 can carry large payloads over long ranges. The advantages of liquid hydrogen as a fuel are pointed out. The effect of size on hypersonic-transport payload is investigated. An airbreathing booster and rocket-powered orbiter stage at Mach 10, in an artist's concept of a shuttle operation is shown. Propulsion system technology is considered. For Mach numbers above about 8, the scramjet offers the most promising approach.

G.R.

A70-44127 * # New approaches to hypersonic aircraft. John V. Becker (NASA, Langley Research Center, Aero-Physics Div., Hampton, Va.). *International Council of the Aeronautical Sciences, Congress, 7th, Rome, Italy, Sept. 14-18, 1970, Paper ICAS 70-16.* 28 p. 31 refs.

The strong interactions between the aerodynamic, structural, and propulsive systems of hypersonic air breathers offer important opportunities for achieving improved vehicles. One of the most promising is the use of the hydrogen fuel heat sink to provide cooling of major areas of the airframe. This possibility is explored in some detail, with considerations of the theoretical possibilities, engine designs for minimum cooling, comparative analysis of candidate high-level cooling systems, recent fluid-mechanical studies of slot cooling, structural designs compatible with practical cooling systems, and aerodynamic features made possible in actively cooled vehicles. The results suggest that hypersonic cruise vehicles constructed of largely unshielded aluminum or titanium alloys are feasible and offer a number of advantages. Further studies of the problems and possibilities of this category of hypersonic vehicles are suggested.

(Author)

A71-44365

Liquid hydrogen as a fuel for the future. Lawrence W. Jones (Michigan, University, Ann Arbor, Mich.). *Science*, vol. 174, Oct. 22, 1971, p. 367-370. 13 refs.

The use of liquid hydrogen as a long-term replacement for hydrocarbon fuel for land and air transportation seems technically feasible. It is an ideal fuel from the standpoint of a completely cyclic system, serving as a 'working substance' in a closed chemical and thermodynamic cycle. The energy-per-unit-weight advantage over gasoline or any other hydrocarbon fuel makes liquid hydrogen particularly advantageous for aircraft and long-range land transport. As a pollution-free fuel, it must be seriously considered as the logical replacement for hydrocarbons in the 21st century.

G.R.

A72-26186

Fabrication and preliminary testing of a 3kW hydrogen resistojet. J. A. Donovan, W. T. Lord, and P. J. Sherwood (Rocket Propulsion Establishment, Westcott, Bucks., England). *American Institute of Aeronautics and Astronautics, Electric Propulsion Conference, 9th, Bethesda, Md., Apr. 17-19, 1972, Paper 72-449.* 16 p. 20 refs. Members, \$1.50; nonmembers, \$2.00.

Description of a hydrogen resistojet incorporating a rhenium heat exchanger and nozzle, with target performance (total power 3.34 kW, overall efficiency 0.790, exhaust velocity 8.09 km/sec) appropriate for the transfer of geostationary communications satellites. The successful fabrication of two such resistojets from two sets of rhenium components is described, and test results are presented and compared with theory. Although a fully welded construction was not achieved, no deleterious effects were observed and the results, which have a high degree of resolution, are self-consistent and conform to theoretical trends. The prospects for the tests at design conditions are therefore encouraging.

(Author)

A72-26754

Energy characteristics of a coaxial plasma source. A. G. Belikov, V. P. Goncharenko, D. K. Goncharenko, N. T. Derepovskii, B. G. Safronov, and N. A. Khizhniak. (*Zhurnal Tekhnicheskoi Fiziki*, vol. 41, Sept. 1971, p. 1881-1886.) *Soviet Physics - Technical Physics*, vol. 16, Mar. 1972, p. 1488-1491. 5 refs. Translation.

Description of a coaxial plasma source designed for studying the energetic characteristics of plasmas. The electrodes of the source are 70 cm long and 3 and 14 cm in diameter, and are separated by a plastic insulator. A pulsed electromagnetic valve is used for gas admission through three transverse slots in the electrode body. A 60-microfarad capacitor battery is used for discharges lasting from 14 to 20 microsec. Plasmoids with energies in excess of 1 kJ are obtained in the source. A linear dependence of the plasmoid energy on the battery-stored energy is established. Fast pure-hydrogen plasmoids can be obtained in the source.

V.Z.

04 SECONDARY ENERGY SOURCES

A73-37498 * # Turbojet emissions - Hydrogen versus JP. J. Grobman, C. Norgren, and D. Anderson (NASA, Lewis Research Center, Cleveland, Ohio). *Working Symposium on Liquid-Hydrogen-Fueled Aircraft, Hampton, Va., May 15, 16, 1973, Paper. 22 p.* 20 refs.

Preliminary data from an experimental combustor show that the NO sub x emission index, g (NO₂)/kg fuel, is about three times greater for hydrogen than for JP at simulated cruise conditions. However, if these results are applied to aircraft designed for a given mission, hydrogen's higher heating value enables the aircraft to have a lower gross weight and a lower fuel flow rate so that the NO sub x emission rate, kg(NO₂)/hr may be reduced about 30% compared to JP. Theoretical kinetics calculations indicate that combustors may be designed for hydrogen that could further decrease NO sub x emissions by taking advantage of hydrogen's wide flammable limits and high burning velocity. (Author)

A73-38413 * # Electrolytic hydrogen fuel production with solid polymer electrolyte technology. W. A. Titterton and A. P. Fickett (General Electric Co., Lynn, Mass.). In: *Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. (A73-38386 19-03)* New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 574-579. 6 refs. NASA-Navy-USAF-supported research.

A water electrolysis technology based on a solid polymer electrolyte (SPE) concept is presented for applicability to large-scale hydrogen production in a future energy system. High cell current density operation is selected for the application, and supporting cell test performance data are presented. Demonstrated cell life data are included to support the adaptability of the SPE system to large-size hydrogen generation utility plants as needed for bulk energy storage or transmission. The inherent system advantages of the acid SPE electrolysis technology are explained. System performance predictions are made through the year 2000, along with plant capital and operating cost projections. (Author)

A73-38436 * # H₂O₂ auxiliary power unit for Space Shuttle vehicles - A progress report. J. P. Joyce, D. G. Beremand, H. M. Cameron, and K. S. Jefferies (NASA, Lewis Research Center, Cleveland, Ohio). *AIAA, AICHE, ANS, ASME, IEEE, SAE, and ACS, Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., Aug. 13-16, 1973, Paper 739028. 9 p.* 5 refs.

Description of a program to establish technology readiness of hydrogen-oxygen (H₂O₂) auxiliary power units for use on board the Space Shuttle orbiter vehicle. Fundamental objectives include experimentally establishing an acceptable propellant flow control method, verification of combustor stability, and adequate thermal management. An initial auxiliary power unit (APU) configuration with recycled hydrogen flow has been studied and revised toward greater simplicity and scaling ease. The selected APU is a recuperated open-cycle, turbine-driven unit. Series flow of cryogenic hydrogen removes internally-generated heat and heat from the hydraulic system. The revised configuration schematic and its calculated performance are reviewed. A weight comparison is made between the shuttle baseline hydrazine and H₂O₂ APU systems, showing that hydrogen-oxygen APUs have the potential of increasing the payload of the Space Shuttle. (Author)

A73-45025 Fuel and hydrogen cells (Les piles à combustible et l'hydrogène). Y. Brelle, A. Grehier, and J. Chéron (Institut Français du Pétrole, des Carburants et Lubrifiants, Paris, France). *Sciences et Techniques*, Sept. 15, 1973, p. 5-15. In French.

The hydrogen cell is promising because it appears to be the only one capable of satisfying the criteria of price, mass output, fuel cost, and availability of materials necessary for access to important outlets. The technical level achieved by this cell should make it possible to undertake a large program of evaluation of the problems posed by the use of hydrogen for generators, automotive power,

power plants, and oceanography. Within the economic context of energy sources and distribution, it is possible to foresee a progressive change from fossil fuel plants to nuclear plants. F.R.L.

N68-12434# Bureau of Mines, Washington, D. C. **INITIATION OF SPHERICAL DETONATION IN ACETYLENE-OXYGEN MIXTURES**

Elton L. Litchfield, Marilyn H. Hay, and David J. Cohen Dec. 1967 11 p refs (BM-RI-7061)

The Bureau of Mines determined minimum energies for direct initiation of expanding gaseous detonation waves in acetylene-oxygen mixtures. Composition limit ranges for the initiation of detonation with fixed energies have been compared to data in the literature. Assuming that the stored electrical energy is completely converted to thermal energy, the agreement between the energy of primary explosive initiators and the energy of electrical discharge initiators was good. Minimum energies for initiation of detonation in the most sensitive composition (40 percent C₂H₂ plus 60 percent O₂) were: 0.64 joule at an initial pressure of 1/4 atmosphere, 5.0×10⁻² joule at 1/2 atmosphere, and 3.7×10⁻³ joule at 1 atmosphere. Fuel concentrations in mixtures initiated to detonation by 4.9×10² joules ranged from 10 to 65 percent C₂H₂ at 1/4 atmosphere, 10 to 67 percent C₂H₂ at 1/2 atmosphere, and 9 to 68 percent C₂H₂ at 1 atmosphere. Author

N68-24657*# National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

ENERGY REQUIRED FOR PROTON PRODUCTION BY ELECTRON IMPACT IN MIXTURES OF ATOMIC AND MOLECULAR HYDROGEN

George M. Prok and Carl F. Monnin Washington 1967 18 p refs Presented at 9th Ann. Meeting of the Plasma Phys. Div. of the Am. Phys. Soc., Austin, Tex., 8-11 Nov. 1967 (NASA-TM-X-52344) CSDL 20H

Energy required for proton and molecular hydrogen ion production by electron impact was calculated for a tenuous hydrogen plasma. The cost was determined for various degrees of dissociation from 0 to 100 percent. The model assumed was a Maxwellian electron gas, in the temperature range of 3 to 100 eV, interacting with cold ground state neutrals. The concentration of the 2s metastable state of atomic hydrogen is shown to be negligible for the cost calculations. The cost decreases sharply with the degree of dissociation, and at energies between 40 and 100 eV and dissociation greater than 5 percent. The results for the monoenergetic case and Maxwellian case agreed to within about 6 percent. At 25 percent dissociation, the proton production cost is about a factor of three greater than that in atomic hydrogen. When the degree of dissociation is 40 percent, the proton production cost is only a factor of two greater than in atomic hydrogen, but it is nearly three orders of magnitude less than in molecular hydrogen. Author

N69-29919# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ENERGY SOURCES IN AIRCRAFT ENGINES

Pin-Chuan Chang 9 Oct. 1968 7 p Transl. into ENGLISH from Hang Kung Chih Shih (China), no. 7, 1960 p 16 (AD-685535; FTD-HT-23-584-68) Avail: CFSTI CSDL 1/3

After reviewing the properties and limitations of chemical fuels such as gasoline, solid fuel and hydrogen fuel, the report discusses the possibilities of ionic fuel and nuclear fuel, and their existing problems of application to aviation. It is stressed that due to the fast scientific progress and requirements, these pending problems may soon be solved. Author (TAB)

N70-10884# Akademiya Nauk URSR, Kiev.

GASIFICATION OF COAL ENRICHMENT WASTES

S. G. Vesselman, L. V. Drobyshch, and N. Ye. Luginin In its

Processes of Combust. and Heat Treat. of Mater. 1967 p 58-62
refs In RUSSIAN

Avail: CFSTI

Coal enrichment wastes with a low yield of volatile materials were separated by specific weight and subjected to gasification in an air blast gas generator. Gas samples were withdrawn from the lower section of the fuel layer at some distance from the fire grate and temperature measurements were made periodically at a specific time to determine the thickness of the layer. The experiments show that coal enrichment wastes are suitable raw materials for extracting fuel gas. The temperature of the fuel layer in the generator should not exceed the softening temperature of the ash, and both the temperature and thickness of the fuel layer should be increased to improve the quality of the extracted gas. The rate of gasification does not depend on the ash content of the waste materials.

Transl. by R.B.

N70-10885# Akademiya Nauk URSR, Kiev.
THE DEPENDENCE OF GAS PRODUCTION COSTS ON THE DEGREE OF OXYGEN BLAST ENRICHMENT DURING GASIFICATION OF LIGNITE UNDER PRESSURE

G. N. Khopta *In its Processes of Combust. and Heat Treat. of Mater.* 1967 p 63-67 refs In RUSSIAN

Avail: CFSTI

On the basis of experimental studies, capital outlays to equip gas works of identical thermal output with gas are hardly dependent on the degree of oxygen blast enrichment and they reach a minimum when oxygen content in the blast is 60%. Operational expenditures for producing a thermal unit of gas increase as the oxygen content in the blast increases. Minimum expenditures are required for air enriched gas and comprise 9.8 million rubles, which is 10% less than those required for oxygen enriched gas. Fuel expenditures for power requirements increase as oxygen concentration in the blast increases, and, with 100% oxygen enrichment, they exceed the fuel expenditure level by 74% compared to the power requirements for air enrichment.

Transl. by R.B.

N70-14509# Lobo (Walter E.), New York.

ACETYLENE AND LOW COST POWER

Walter E. Lobo *In AEC Abundant Nucl. Energy* May 1969 p 83-92 refs

Avail: CFSTI

The various processes for the manufacture of acetylene are briefly reviewed with particular emphasis on those processes that use electrical energy as the main energy source. The cost of energy, although important, is not considered a large enough factor that low-cost power would revolutionize the acetylene-production picture.

Author (NSA)

N70-14511# Oak Ridge National Lab., Tenn.

THE ECONOMICS OF HYDROGEN AND OXYGEN PRODUCTION BY WATER ELECTROLYSIS AND COMPETITIVE PROCESSES

J. E. Mrochek *In AEC Abundant Nucl. Energy* May 1969 p 107-122 refs

Avail: CFSTI

The manufacturing costs of hydrogen and oxygen are estimated for water-electrolysis plants using two types of advanced electrolytic cells: porous-electrode cells and high-temperature vapor-phase cells. Electrolytic plants producing 40 million standard cubic feet of hydrogen and 860 tons of oxygen per day are compared with fossil-fuel plants that use steam reforming and partial-oxidation processes at the same hydrogen-production rates. The cost of electricity required for the electrolytic process using a porous-electrode cell to break even with the fossil-fuel processes ranged from 0.8 to 2.3 mills/kw-hr. If an oxygen credit of \$4/ton was assumed, this break-even power cost range increased to 1.5

to 3 mills/kw-hr. The use of electrolytic hydrogen plants as load-leveling devices for power plants is discussed briefly.

Author (NSA)

N70-14512# Tennessee Valley Authority, Muscle Shoals, Ala.
PRODUCTION OF AMMONIA USING LOW-COST NUCLEAR ENERGY

Glenn M. Blouin *In AEC Abundant Nucl. Energy* May 1969 p 123-134 refs

Avail: CFSTI

It is postulated that expected near-term (10-yr) advances in nuclear electrical power stations and in hydrogen electrolysis cells will reduce costs to the point where electrolytic ammonia will be competitive in areas where conventional hydrocarbon feedstocks must be imported. Furthermore, far-term (20-yr) advances in reactor and electrolysis-cell technology could result in significant economic advantages over conventional ammonia processes.

Author (NSA)

N70-18542# Federal Aviation Administration, Washington, D.C.
Office of Supersonic Transport Development.

FUEL CONSIDERATIONS IN THE US SUPERSONIC TRANSPORT PROGRAM

Joseph C. Saia 24 Oct. 1968 28 p refs Presented at the Jet Fuel Quality Symp., San Antonio, 22-24 Oct. 1968

(AD-696588) Avail: CFSTI CSCL 21/4

The type of fuel selected for use in the United States Supersonic Transport (SST) is commercial Jet A kerosene. The importance of the fuel cost factor in SST direct operating cost, and the reasons for excluding the use of commercial Jet B aviation turbine fuel for the SST, are briefly discussed in this paper. A general description of the SST aircraft and engine fuel systems, and the typical environmental conditions to which the fuel will be exposed, are included. The SST fuels test programs are summarized.

Author (TAB)

N70-20511# Bureau of Mines, Bartlesville, Okla. Petroleum Research Center.

INFLUENCE OF VOLATILE FUEL COMPONENTS ON VEHICLE EMISSIONS

B. H. Eccleston, B. F. Noble, and R. W. Hurn Feb. 1970 85 p refs

(BM-RI-7291) Avail: Issuing Activity

The effect of fuel volatility and front-end fuel composition on the amount and photochemical reactivity of automobile exhaust and fuel system evaporative emissions was studied. The study involved six gasolines; the base fuel, three fuels of varied volatility, and two fuels differing from the base and from each other in front-end olefin content. Data were obtained from 16 vehicles operated on a chassis dynamometer using a speed-load-time cycle that approximated a typical urban trip. Tests were made at ambient temperatures using a climate-controlled dynamometer room. The amount of hydrocarbon emission and its probable photochemical effect is expressed as weight of a moderately reactive material, ethylene. Emissions of oxides of nitrogen, carbon monoxide, and aldehydes were also observed. Results show that reduction of volatility from typical levels reduces both the amount and the reactivity equivalent of evaporative losses with a slight increase in exhaust emissions. Alternatively, reducing the amount of light olefin in the fuel had no effect on the amount of hydrocarbon pollutant but did significantly reduce the reactivity equivalent of the emissions. Neither volatility change nor chemical changes to the fuel significantly affected the nonhydrocarbon emissions.

Author

N70-42326*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THERMAL FEASIBILITY OF USING METHANE OR HYDROGEN FUEL FOR DIRECT COOLING OF A FIRST-STAGE TURBINE STATOR

Raymond S. Colladay Washington Oct. 1970 25 p refs

(NASA-TN-D-6042; E-5701) Avail: NTIS CSCL 20M

04 SECONDARY ENERGY SOURCES

The feasibility of cooling the first-stage turbine stator directly with cryogenic fuels was investigated based on a numerical heat transfer analysis of methane and hydrogen-cooled vanes. An insulation barrier between the fuel cooling passages and the external vane surface was required to prevent adverse cooling conditions. The cooling configuration analyzed was that of tubular cooling passages embedded in insulation material surrounded by an outer vane shell. The results indicate that the turbine stator vanes could be adequately cooled with methane or hydrogen fuel at a 2490 F (1639 K) local-hot-spot gas temperature. Author

N71-19463* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CRYOGENIC FUELS FOR AIRCRAFT

Jack B. Esgar. *In its Aircraft Propulsion* 1971 p 397-420 refs

Avail: NTIS HC\$6.00/MF\$0.95 CSCL 21D

Exploratory research on the use of cryogenic fuels for airbreathing gas turbine engines is presented. The two prime reasons for the interest in cryogenic fuels for advanced aircraft are the higher heating value per pound of fuel and the heat sink capacity that is available in this fuel for cooling hot components in the engine or the aircraft. The possible applications of liquid methane to a supersonic transport type aircraft and the application of liquid hydrogen to the airbreathing engines for recoverable boosters and orbiters for the space shuttle are discussed. Author

N72-18520# Energy Research Corp., Bethel, Conn.
HYDROGEN GENERATOR ASSEMBLIES Final Report.
Mar. 1970 - Mar. 1971

Richard Engdahl and E. S. Tillman, Jr. Sep. 1971 70 p refs
(Contract DAAB07-70-C-0153; DA Proj. 1G6-63702-DG-10)
(AD-733931; ECOM-0153-F) Avail: NTIS CSCL 13/7

The objective of the work was to evaluate design criteria for a simplified hydrogen generator for a 500 watt fuel cell. The hydrogen is produced by the catalytic steam reforming of vaporized JP-4 fuel with subsequent purification through a palladium-silver separator. The experimental studies were performed on a breadboard type system. This system contained all of the major sub-components required in an actual portable unit for field use. GRA

N72-18911* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

STRUCTURAL WEIGHT ANALYSIS OF HYPERSONIC AIRCRAFT

Mark D. Ardema. Washington Mar. 1972 50 p refs
(NASA-TN-D-6692; A-3905) Avail: NTIS CSCL 20K

The weights of major structural components of hypersonic, liquid hydrogen fueled aircraft are estimated and discussed. The major components are the body structure, body thermal protection system tankage and wing structure. The method of estimating body structure weight is presented in detail while the weights of the other components are estimated by methods given in referenced papers. Two nominal vehicle concepts are considered. The advanced concept employs a wing-body configuration and hot structure with a nonintegral tank, while the potential concept employs an all body configuration and cold, integral pillow tankage structure. Characteristics of these two concepts are discussed and parametric data relating their weight fractions to variations in vehicle shape and size design criteria and mission requirements, and structural arrangement are presented. Although the potential concept is shown to have a weight advantage over the advanced, it involves more design uncertainties since it is farther removed in design from existing aircraft. Author

N73-33738# Atomic Energy Commission, Washington, D.C.
HYDROGEN AND OTHER SYNTHETIC FUELS: A SUMMARY OF THE WORK OF THE SYNTHETIC FUELS PANEL
Sep. 1972 135 p refs

(TID-26136) Avail: NTIS MF \$1.45; SOD HC \$2.25

The development of hydrogen as a synthetic fuel is attractive because it is essentially clean burning, the main combustion product being water; it may be substituted for nearly all fuel uses; it can be produced from domestic resources; it is available from a renewable and universal raw material-water; and nearly all primary energy sources, nuclear, solar, etc., may be used in its production. The main obstacles to the use of hydrogen as a universal fuel are its high cost relative to the current low prices for fossil fuels and, for some applications, the unresolved problems of handling a low-density or a cryogenic fluid. Safety considerations are discussed. The various options for the production of hydrogen, namely, electrolysis, thermochemical, biological, radiolytic, and various combinations, and the production of other synthetic fuels, particularly those made from hydrogen are discussed. Other synthetic fuels considered include ammonia (NH₃), hydrazine (N₂H₄), methanol (CH₃OH), methane (CH₄), ethanol (C₂H₅OH), and gasoline (C₈H₁₈). NSA

05 ENERGY CONVERSION

Includes photovoltaic power conversion; superconductive or cryogenic systems for electric production; electromagnetic wave energy conversion; plasmas and magnetohydrodynamics; fuel cells; thermionic or thermoelectric conversion; liquid metal conversion; and thermomechanical energy conversion using Brayton cycle (gas turbines or gas turbine engines), Rankine or Stirling cycles, topping or bottoming cycles.

A68-10231

RADIOISOTOPE POWER SUBSYSTEMS FOR SPACE APPLICATION. D. F. Berganini and E. T. Mahekey, Jr. (USAF, Systems Command, Research and Technology Div., Aero Propulsion Laboratory, Aerospace Power Div., Wright-Patterson AFB, Ohio).

IN: INTERNATIONAL SYMPOSIUM ON SPACE TECHNOLOGY AND SCIENCE, 6TH, TOKYO, JAPAN, NOVEMBER 29-DECEMBER 4, 1965, PROCEEDINGS.

Edited by Daikichiro Mori.

Tokyo, AGNE Publishing, Inc., 1966, p. 553-562. 7 refs.

Examination of current and projected performance capabilities of radioisotope power subsystems for space applications. The isotope subsystem is not affected by orbital dark time as are the solar energy concepts; current technology allows routine heat source operation in the 500 to 750°C regime. Isotope heat source design considerations are discussed, and power conversion methods (thermoelectric, thermionic, Rankine cycle, and Brayton cycle) are considered. The Brayton cycle offers the highest efficiency of all the dynamic schemes investigated, providing that heat source designs can be evolved to provide turbine inlet temperatures of 2000°R. B.B.

A68-11240

DIRECT CONVERSION OF THERMAL ENERGY TO ELECTRIC ENERGY - THERMOELECTRIC CONVERSION [LA CONVERSION DIRECTE DE L'ENERGIE THERMIQUE EN ENERGIE ELECTRIQUE - LA CONVERSION THERMOELECTRIQUE].

Bernard Lespinasse (Institut National des Sciences Appliquées, Lyons, France).

Sciences et Industries Spatiales, vol. 3, no. 9-10, 1967, p. 43-54. 14 refs. In French.

Consideration of the conversion of thermal energy into electric energy by means of a thermoelectric converter or generator (the only method of converting from thermal energy to electric energy that has actually been used in space). The thermoelectric converter consists of a group of thermocouples placed between a heat source and a radiator feeding a cold source. The hot junctions are generally heated by an isotopic source or, more rarely, by the cooling fluid of a nuclear reactor. This source could also be solar energy concentrated in the focus of a mirror. Thermoelectric processes, Kelvin relationships, efficiency of a thermocouple, and choice of materials are discussed. The SNAP-3, SNAP-9, and SNAP-10A isotopic generators are cited as examples of such space-power systems. The efficiency of thermoelectric converters is low, and their use is limited to low powers. F.R.L.

A68-11941

INFINITELY SEGMENTED ELECTRODES - MAGNETOTHERMOELECTRIC DEVICES.

Ozer A. Arnas (Louisiana State University, Mechanical Engineering Dept., Baton Rouge, La.).

American Society of Mechanical Engineers, Winter Annual Meeting, Pittsburgh, Pa., Nov. 12-17, 1967, Paper 67-WA/ENER-2. 7 p. 13 refs.

Members, \$0.75; nonmembers, \$1.50.

Analysis of the performance and characteristics of magnetothermoelectric direct energy-conversion devices with "infinitely segmented" electrodes. This analysis is based on the nonequilibrium thermodynamic analysis of the mechanics of transport processes

taking place in a solid due to simultaneous flow of thermal and electrical currents in the presence of externally applied magnetic fields. In the case of the magnetothermoelectric generator, results pertaining to power developed, thermal efficiency, and the optimum values of these parameters are presented. In the case of the magnetothermoelectric cooler, results pertaining to induced temperature difference, coefficient of performance, and the optimum values of these parameters are presented. M.F.

A68-12258

A GRAPHICAL PRESENTATION OF MAGNETOGASDYNAMIC ACCELERATOR AND GENERATOR PERFORMANCE CHARACTERISTICS.

W. L. Powers (Augusta College, Physics Dept., Augusta, Ga.), J. B. Dicks, and W. T. Snyder (Tennessee, University, Space Institute, Tullahoma, Tenn.).

AIAA Journal, vol. 5, Dec. 1967, p. 2232-2236. 8 refs. Contract No. AF 33(615)-2691.

Graphical display of the generalized Ohm's law which is assumed to describe the local electrical characteristics of MGD accelerators and generators. Dimensionless electric fields and current densities are defined which simplify the problem and allow a dimensionless power density and a scaled efficiency to be written and presented on a performance map. The operating features of the continuous electrode, Faraday, diagonal conducting wall, and Hall accelerators and generators are represented on the same map for purposes of comparison. The operating equations pertinent to each of the special devices are also written with more emphasis given to the diagonal conducting wall device. It is shown how this map may be used in evaluating MGD channel performance, and how it materially aids in channel design and in selecting the most desirable type of device for a given requirement. (Author)

A68-12962

THERMIONIC POWER GENERATION.

L. G. Sanders (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Harwell, Berks., England).

IN: ADVANCED ELECTRONIC TECHNIQUES; PROCEEDINGS OF THE SECOND OXFORD LECTURE COURSE, OXFORD, ENGLAND, JULY 1966.

Lecture Course sponsored by Electronic Components and Instrument Practice.

Edited by G. W. A. Dummer.

London, United Trade Press, Ltd., 1967, p. 132-142.

Outline of the general principles of thermionic power generation. Neutralization and the unignited and ignited modes of a thermionic converter are discussed. The observed performance from a practical converter is considered, and values representing its performance with a Mo emitter and Ni collector are plotted. Electrically heated converters and flame and fission heat sources are investigated. B.B.

A68-13240

HYDRAZINE-AIR FUEL CELLS.

George E. Evans (Union Carbide Corp., Parma Technical Center, Fuel Cell Dept., Parma, Ohio) and Karl V. Kordes (Union Carbide Corp., Parma Technical Center, Parma, Ohio).

Science, vol. 158, Dec. 1, 1967, p. 1148-1152. 17 refs.

Description of the construction and performance characteristics of hydrazine-air fuel cells. In these cells the hydrazine fuel is supplied as a dilute solution of hydrazine in a circulating "anolyte" consisting of an approximately 9N solution of KOH in water. A portion of the dissolved hydrazine in the anolyte diffuses into a porous conductive anode, where it reacts electrochemically to produce nitrogen, water, and electrons. The water and bubbles of gaseous nitrogen are swept away in the circulating anolyte, while the electrons flow from the anode by way of metallic current collectors to the external load circuit. The hydroxyl ions consumed in the anode reaction are supplied by a KOH electrolyte immobilized in a microporous matrix (usually asbestos) positioned between the electrodes. P. v. T.

A68-14136

THERMOELECTRIC RADIOISOTOPE GENERATORS [GENERATEURS THERMOELECTRIQUES A RADIOISOTOPES].

05 ENERGY CONVERSION

H. J. Albany (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Service d'Electronique Physique, Gif-sur-Yvette, Hauts-de-Seine, France).
Entropie, no. 17, Sept.-Oct. 1967, p. 79-83. 6 refs. In French.

Study of phenomena serving as the basis for thermoelectric conversion of energy and examination of the factors determining generator performance. Selection criteria for radioisotopes as sources of energy are given, with a review of the characteristics of some of these compounds. The possibilities of using thermoelectric radioisotope converters as power generators in spatial, terrestrial, oceanographic, and medical fields are emphasized. The development and achievements of these generators within the last few years are reviewed. M.F.

A68-14861

CONVENTIONAL AND "EXOTIC" ELECTROCHEMICAL ENERGY GENERATORS [GENERATEURS D'ENERGIE D'ORIGINE ELECTROCHIMIQUE CLASSIQUES ET "EXOTIQUES"].

J.-F. Laurent (Société des Accumulateurs Fixes et de Traction, Poitiers, France).

(Société Française des Electriciens, Meeting, France, Feb. 21, 1967, Communication.)

Revue Générale de l'Electricité, vol. 76, Nov. 1967, p. 1397-1405. In French.

Discussion of the operating principles of conventional and "exotic" electrochemical generators. The main types of primary, secondary, and energizable generators are listed, and their major advantages are discussed. The requirements to be met by all energy sources of electrochemical origin are reviewed. The main characteristics of conventional and exotic galvanic cells are studied, and the importance of solvent electrical activity is stressed. The possibilities of future applications are considered. M.F.

A68-15139

EXPLOSIVE GENERATORS.

E. I. Bichenkov (Akademiia Nauk SSSR, Sibirskoe Otdelenie, Institut Gidrodinamiki, Novosibirsk, USSR).

(Akademiia Nauk SSSR, Doklady, vol. 174, June 1, 1967, p. 779-782.)

Soviet Physics - Doklady, vol. 12, Dec. 1967, p. 567-569. 8 refs. Translation.

Discussion of low-induction explosion-type generators designed to convert the energy of explosives into magnetic energy. The design and performance of both coaxial and two-busbar generators of this type are described. Line-drawings and current oscillograms are given. V. Z.

A68-15423

EFFECT OF THE MAGNETIC REYNOLDS NUMBER IN THE INDUCTION STRIATED-FLOW MHD GENERATOR.

J. Milewski (Polska Akademia Nauk, Instytut Maszyn Przepływowych, Gdańsk, Poland).

Académie Polonaise des Sciences, Bulletin, Série des Sciences Techniques, vol. 15, no. 9, 1967, p. 753-760.

Analysis of the effect of leakages of induced magnetic fields from the ferromagnetic core to the outside on the operation of a synchronous induction, striated-flow MHD generator. The striated flow of the working medium through the generator duct consists of alternate conducting and nonconducting sections. It is concluded that an effect of magnetic leakages does exist and its quantitative measure is the value of the magnetic Reynolds number R_m . The influence of the magnetic losses may be neglected in the case of a small R_m . In the case of a large R_m , some relative drop in the generator output may take place without any other disturbances. It is determined that from the practical viewpoint the effect of magnetic leakages may be disregarded. T. M.

A68-15642 =

EFFECTIVE CONDUCTIVITY IN A SEGMENTED-ELECTRODE MAGNETOHYDRODYNAMIC GENERATOR WITH ELEVATED ELECTRON TEMPERATURE.

S. Guha and Y. P. Singh (Indian Institute of Technology, Dept. of

Physics, New Delhi, India).

British Journal of Applied Physics, vol. 18, Dec. 1967, p. 1819, 1820. Research supported by the Council of Scientific and Industrial Research of India.

Calculation of the effective conductivity in a segmented-electrode MHD generator under typical operating conditions. For this calculation, a power law is used for the dependence of the electron collision frequency on the electron velocity, together with expressions derived by Sodha (1965). M.F.

A68-16360

CONTRIBUTION TO THE STUDY OF END EFFECTS ON THE FLOW IN MHD GENERATORS [CONTRIBUTION A L'ETUDE DES EFFETS D'EXTREMITE SUR L'ECOULEMENT DANS LES GENERATEURS MAGNETOHYDRODYNAMIQUES].

L. Dragoș (București, Universitatea, Bucharest, Rumania).

Revue Roumaine de Mathématiques Pures et Appliquées, vol. 12, no. 9, 1967, p. 1193-1205. 8 refs. In French.

Study of the plane flow of an electrically conducting fluid in an infinite nozzle with perfectly conducting and isolating walls under specified conditions. The flow takes place in the presence of an external magnetic field applied in the region of the electrodes, an orthogonal field in the plane of the flow. The mathematical problem is reduced to a system of two partial derivative equations of the second order, the distribution coefficients being known. Using two Green functions, an iterative procedure is given which makes it possible to determine all the approximations of the function of the current and electric potential. The exact solution of the problem is determined by an integral equation. M.F.

A68-16523

PULSE MHD GENERATOR WITH A SUPERCONDUCTING MAGNETIC SYSTEM [IMPUL'SNYI MAGNITOGIDRODINAMICHESKII GENERATOR SO SVERKHPROVODIASHCHEI MAGNITNOI SISTEMOI].

V. A. Kirillin, A. E. Sheindlin, E. I. Asimovskii, V. V. Sychev, V. B. Zenkevich, A. M. Maksimov, and V. A. Al'tov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

Akademiia Nauk SSSR, Doklady, vol. 177, Nov. 1, 1967, p. 77-80. In Russian.

Experimental verification of the theory of a pulse MHD generator employing a superconducting magnetic system. The design and schematic diagram of the generator used in the experiments are described, and a graph showing the distribution of the magnetic induction along the channel axis is given. Tests in which the magnetic system was disconnected from the generator supply sources and the supply of liquid helium in the cryostat was not replenished showed that the magnetic field intensity remained at a constant level. V.P.

A68-17540 *#

A REACTOR CONCEPT FOR SPACE POWER EMPLOYING THERMIONIC DIODES AND HEAT PIPES.

Colin A. Heath (NASA, Lewis Research Center, Cleveland, Ohio)

and Edward Lantz (NASA, Lewis Research Center, Reactor Analysis Section, Cleveland, Ohio).

American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 6th, New York, N.Y., Jan. 22-24, 1968, Paper 68-122, 9 p. 18 refs.

Members, \$1.00; nonmembers, \$1.50.

Investigation of a thermionic generator power system using a reactor heat source connected to external diodes by heat pipes. A concept is proposed which appears capable of supplying up to several hundred kilowatts of electrical power. Experimental results from laboratory tests of both heat pipes and thermionic diodes have been used to set reasonable performance levels for thermionic diodes which are both heated and cooled by heat pipes. A reactor fueled with slab geometry fuel elements of uranium-233 nitride could provide a minimum power of 36 kwe limited by criticality considerations. Reactor control is effected by a combination of moderator and neutron absorbing material in a central region of the reactor. Neutronic calculations indicate that a 6% swing in reactivity is obtainable with this control system. Total mass of the reactor, thermionic diodes, radiator, and reactor shield for an instrumented payload is estimated to be 300 kg. (Author)

A68-17791

DIRECT ENERGY CONVERSION [ENERGIE DIREKTUMWANDLUNG].

Edited by K. J. Euler (Varta AG, Frankfurt am Main, West Germany).

Munich, Verlag Karl Thieme KG (Thieme-Taschenbücher. Volume 10), 1967. 371 p. In German.

\$6.70.

CONTENTS:

FOREWORD [VORWORT]. K. J. Euler (Varta AG, Frankfurt am Main, West Germany), p. x-xii.

TECHNICAL PROBLEMS OF DIRECT ENERGY CONVERSION

[TECHNISCHE PROBLEME DER ENERGIE-DIREKTUMWANDLUNG]. K. J. Euler (Varta AG, Frankfurt am Main, West Germany), p. 1-25.

PHOTOVOLTAIC ENERGY CONVERSION [PHOTOELEKTRISCHE ENERGIEWANDLUNG]. Hans Pfister (Siemens AG, Erlangen, West Germany), p. 26-61. 86 refs.

THERMOELECTRIC CURRENT GENERATORS [THERMO-ELEKTRISCHE STROMERZEUGER]. Ulrich Birkholz (Karlsruhe, Technische Hochschule, Karlsruhe, West Germany), p. 62-100. 24 refs.

PRESENT STATE OF THERMIONIC CONVERTERS [ÜBER DEN HEUTIGEN STAND DER THERMIONIK-KONVERTER]. Josef Bohdanský and Helmut Neu (EURATOM, Ispra, Italy), p. 101-135. 47 refs.

RADIONUCLIDE BATTERIES [RADIONUKLID-BATTERIEN]. Arthur Scharmann (Giessen, Universität, Giessen, West Germany), p. 136-173. 20 refs.

PROBLEMS AND PRESENT STATUS OF DIRECT CONVERSION OF CHEMICAL TO ELECTRICAL ENERGY - GALVANIC FUELS [PROBLEMATIK UND STAND DER DIREKTUMWANDLUNG VON CHEMISCHER IN ELEKTRISCHE ENERGIE - GALVANISCHE BRENNSTOFFZELLEN]. August Winsel (Varta AG, Taunus, West Germany), p. 174-220.

ENERGY CONVERSION IN MAGNETOHYDRODYNAMIC (MHD) GENERATORS [ENERGIEWANDLUNG MIT MAGNETOHYDRODYNAMISCHEN (MHD-) GENERATOREN]. Thomas Bohn and Ernst A. Nickisch (EURATOM and Kernforschungsanlage, Jülich, West Germany), p. 221-267. 58 refs.

MAGNETOHYDRODYNAMIC NUCLEAR REACTOR POWER PLANTS [MAGNETO-HYDRODYNAMISCHE KERNREAKTOR-KRAFTWERKE]. Thomas Bohn and Siegfried Förster (Kernforschungsanlage, Jülich, West Germany), p. 268-305.

PROSPECTS FOR NONCONVENTIONAL HIGH-POWER CURRENT GENERATORS [DIE AUSSICHTEN UNKONVENTIONELLER STROMERZEUGER FÜR GROSSE LEISTUNGEN]. K. J. Euler (Varta AG, Frankfurt am Main, West Germany), p. 306-346.

SUBJECT INDEX [SACHVERZEICHNIS], p. 347-357.

A68-17792

TECHNICAL PROBLEMS OF DIRECT ENERGY CONVERSION [TECHNISCHE PROBLEME DER ENERGIE-DIREKTUMWANDLUNG].

Karl Joachim Euler (Varta AG, Frankfurt am Main, West Germany).

IN: DIRECT ENERGY CONVERSION [ENERGIE DIREKTUMWANDLUNG].

Edited by K. J. Euler.

Munich, Verlag Karl Thieme KG (Thieme-Taschenbücher. Volume 10), 1967, p. 1-25. In German.

Enumeration of the most important difficulties standing in the way of direct energy conversion. The various processes of direct energy conversion are discussed. These are: thermoelectric current generation, radionuclide batteries, thermionic converters, galvanic fuel cells, and MHD generators. A summary of the viewpoints of various authors is given. P.v.T.

A68-17793

PHOTOVOLTAIC ENERGY CONVERSION [PHOTOELEKTRISCHE ENERGIEWANDLUNG].

Hans Pfister (Siemens AG, Forschungslaboratorium, Erlangen, West Germany).

IN: DIRECT ENERGY CONVERSION [ENERGIE DIREKTUMWANDLUNG].

Edited by K. J. Euler.

Munich, Verlag Karl Thieme KG (Thieme-Taschenbücher. Volume 10), 1967, p. 26-61. 86 refs. In German.

Discussion of the efficiency of a p/n-junction photovoltaic cell for the conversion of monochromatic radiation and sunlight, mentioning the factors limiting the performance. A review of various solar cells is given, dealing especially with silicon cells and polycrystalline thin-film cells. The cells used for satellite-power supply have so far been exclusively of the silicon type, permitting efficiencies up to 12%. The life of these cells is normally limited by radiation damage, which is much lower for silicon n/p cells than for p/n cells. GaAs cells and polycrystalline thin-film cells possess a higher resistance to radiation damage than silicon cells. Although the efficiencies attained with thin-film cells are not as high as those of single-crystal cells, they have a more favorable power-to-weight ratio, and production costs are considerably lower. Reference is made to the anomalously high photovoltages observed in thin films, to the better utilization of the energy of the solar spectrum by cells with a p-n heterojunction and to the thermophotovoltaic converter for the direct conversion of thermal to electric energy. P.v.T.

A68-17797

ENERGY CONVERSION IN MAGNETOHYDRODYNAMIC (MHD) GENERATORS [ENERGIEWANDLUNG MIT MAGNETOHYDRODYNAMISCHEN (MHD-) GENERATOREN].

Thomas Bohn and Ernst A. Nickisch (EURATOM and Kernforschungsanlage, Institut für technische Physik, Jülich, West Germany).

IN: DIRECT ENERGY CONVERSION [ENERGIE DIREKTUMWANDLUNG].

Edited by K. J. Euler.

Munich, Verlag Karl Thieme KG (Thieme-Taschenbücher.

Volume 10), 1967, p. 221-267. 58 refs. In German.

Outline of the basic principles of magnetohydrodynamic power generation. The electric conductivity of MHDs is caused by the thermal ionization of alkali-seeded flame exhausts or noble gases. An endeavor is being made to increase the conductivity of MHDs. The instabilities of electrothermal, electroacoustic, and mixed-type MHDs are investigated. It is found that energy can be extracted from the working fluid by braking the electromagnetic forces. Many problems still remain unsolved, such as difficulties in the field of high-temperature walls, electrodes, and insulation material. Other problems must be faced in the design of air preheaters and in the development of large magnets. P.v.T.

A68-17827

MULTI-FUEL 100 WATT TE GENERATOR.

Andrew Herchakowski (U.S. Army, Electronics Command, Fort Monmouth, N.J.).

IN: U.S. ARMY, ELECTRONICS COMMAND, ANNUAL POWER SOURCES CONFERENCE, 21ST, ATLANTIC CITY, N.J., MAY 16-18, 1967, PROCEEDINGS.

Red Bank, N.J., PSC Publications Committee, 1967. 5 p.

Determination of the feasibility of mating an ultrasonic atomizing burner, developed by the Battelle Memorial Institute (BMI), with the RCA SiGe thermoelectric converter. The progress of this program is reported, together with results of tests made on a 100-watt exploratory model for both atomizer and vaporized burner systems for comparison. The work accomplished during this program demonstrates the feasibility of combining the BMI atomizing type burner with the RCA SiGe converter into a workable fossil-fuel-fired thermoelectric generator system. The BMI burner brings with it the features of multifuel use, simplified construction, reduced size and weight, increased ruggedness, the capabilities of simplified and practical field operation, increased mantle life, and improved performance reliability. P.v.T.

A68-18285 #

PLASMA STABILITY AND VOLTAGE FLUCTUATIONS IN AN MHD GENERATOR [USTOICHIVOST' PLAZMY I KOLEBANIIA NAPRIAZHENIIA MGD-GENERATORA].

R. V. Ganefel'd and E. P. Strashinin.

Magnitnaia Gidrodinamika, no. 4, 1967, p. 33-36. 8 refs. In Russian.

05 ENERGY CONVERSION

Discussion of the stability of the isothermal equilibrium plasma of an MHD generator in the presence of potential and nonpotential perturbation waves in the ionized component of the working body. It is shown that strong electromagnetic and/or acoustic waves, which do not drift with the plasma flux, may produce a voltage modulation in MHD generators. The modulation frequencies determined theoretically are in good agreement with observations.

V. Z.

A68-18450

CALCULATION OF MAGNETOHYDRODYNAMIC FLOWS AND THE PROBLEM OF OBTAINING AN OPTIMAL MHD GENERATOR [K RASCHETU MAGNITOGIDRODINAMICHESKIKH TECHENII I-ZADACHA OTYSKANIIA OPTIMAL'NOGO MGD-GENERATORA]. N. I. Kolosnitsyn and K. P. Staniukovich (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Elektromekhaniki, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 5, Nov.-Dec. 1967, p. 1087-1093. In Russian.

Application of a quasi-one-dimensional approximation of magnetohydrodynamic flow to the calculation of magnetohydrodynamic flow in a channel and to the problem of achieving the optimum regime of power generation in an MHD generator. The problem of determining the optimal conditions of power generation is reduced to obtaining a certain optimal function of the magnetic field and to finding the optimal boundary conditions when that function is known. Specifically the optimization of an MHD generator is analyzed by determining an optimal function of the magnetic field which will ensure the maximum power functional for a given generator length, or, conversely, the minimum generator length for a given power functional.

T. M.

A68-19482

PLASMA HEATING BY THE FAST HYDROMAGNETIC WAVE. K. Chung and M. A. Rothman (Princeton University, Plasma Physics Laboratory, Princeton, N.J.). *Physics of Fluids*, vol. 10, Dec. 1967, p. 2634-2641. 16 refs. AEC Contract No. AT (30-1)-1238; NSF Grant No. GP-579.

The fast (right-handed) hydromagnetic wave is generated by a Stix coil installed on the Model C stellarator. Maximum wave generation and heating occurs, as expected, under conditions such that the wavelength of the propagating wave equals the wavelength of the coil structure. Measurements of diamagnetic pressure determine the efficiency for conversion of rf power into thermal energy. Theoretical calculations of heating rates show that plasma resistivity and Landau damping are insufficient to account for the observed heating rates if only the body wave is considered. Introduction of surface waves associated with finite electron mass results in increased E_z fields which enhance the heating rate. (Author)

A68-19561

SELECTION OF THE FLOW REGIME IN AN MHD GENERATOR WITH SERIES-CONNECTED ELECTRODES [K VOPROSU O VYBORE REZHIMA TECHENIIA V MGD-GENERATORE S POSLEDOVATEL'NYM SOEDINENIEM ELEKTRODOV].

A. I. El'kin and E. I. Iantovskii. *Akademii Nauk SSSR, Izvestiia, Energetika i Transport*, Nov.-Dec. 1967, p. 107-113. 5 refs. In Russian.

Analysis, in a quasi-one-dimensional approximation, of the flow of plasma in an MHD channel with series-connected segmented electrodes - i.e., with a fixed direction of the electric field and the absence of a longitudinal current. The flow regime is examined for the cases of constant Mach number, constant temperature, and constant electrical efficiency. The possibility of efficient energy conversion is demonstrated for an MHD generator with a single electrical load. For multiatomic gases, a supersonic flow regime is recommended with a variable angle of inclination of the equipotentials such that there is no longitudinal current in the gas and the local electrical efficiency is constant.

T. M.

A68-19791 *

PROGRESS IN AIRCRAFT GAS TURBINE ENGINE DEVELOPMENT. Abe Silverstein (NASA, Lewis Research Center, Cleveland, Ohio).

(International Council of the Aeronautical Sciences, Congress, 5th, London, England, Sept. 12-16, 1966.)

IN: AEROSPACE PROCEEDINGS 1966; ROYAL AERONAUTICAL SOCIETY, CENTENARY CONGRESS AND INTERNATIONAL COUNCIL OF THE AERONAUTICAL SCIENCES, CONGRESS, 5TH, LONDON, ENGLAND, SEPTEMBER 12-16, 1966. VOLUME 2.

Edited by Joan Bradbrooke, Joan Bruce, and R. R. Dexter. London, Macmillan and Co., Ltd., 1967, p. 587-604; Discussion, A. C. Ackerman (Ackerman Consultants, Canoga Park, Calif.), p. 604, 605. 5 refs.

Discussion of current research and development efforts on materials and cooling of aircraft gas-turbine engines. The better cast nickel-based alloys now available allow turbine-inlet temperatures as high as 1800°F without any assistance from cooling and tantalum alloys with oxidation-resistant coatings as high as 2400°F. Inlet-engine matching problems and engine-cooling studies offer the possibility of much higher turbine-inlet temperatures than are now used, when properly applied. The use of liquid methane as a turbine engine fuel offers interesting possibilities because of its higher heating value, greater cooling capacity, and lower current price per pound. Prospects for reducing the noise associated with fan-jet powered aircraft are also encouraging.

W. A. E.

A68-19849 **

PERFORMANCE CHARACTERISTICS OF A SINGLE-WAVELENGTH LIQUID-METAL MHD INDUCTION GENERATOR WITH END-LOSS COMPENSATION.

Donald J. Cerini and David G. Elliott (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). *AIAA Journal*, vol. 6, Mar. 1968, p. 503-510. 13 refs.

Experiments were performed on a 1000-watt, 700-Hz, constant-velocity, ac MHD induction generator using room-temperature sodium-potassium alloy (NaK) as the working fluid. The purpose of the experiments was to determine the electrical losses and power production in the fluid with a winding of the type expected to provide maximum efficiency in the short generators required for low friction loss in liquid-metal MHD power systems. The winding produced a single-wavelength traveling field together with oscillating compensating fields at each end of the generator to cancel the voltage induced between the conducting side plates by the termination of the traveling field. The efficiency of power generation in the fluid reached 0.54 at a slip s of 0.55, compared with the ideal efficiency $(1+s)^{-1} = 0.65$ of an infinite-length generator. The compensating fields canceled the side-plate voltage and reduced the electrical end losses in the fluid by a factor of 7. (Author)

A68-19914

DETERMINATION OF THE STABILIZATION TIME OF THE NON-EQUILIBRIUM STATE AT THE ENTRANCE TO A MHD-GENERATOR CHANNEL.

V. A. Biturin and P. P. Ivanov (Akademii Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). (*Teplotfizika Vysokikh Temperatur*, vol. 5, May-June 1967, p. 418-422.)

High Temperature, vol. 5, May-June 1967, p. 376-379. 9 refs.

Translation.

Analysis of the buildup process of a nonequilibrium ionization of an argon plasma with cesium additions under conditions corresponding to a plasma flowing into an MHD channel. The time required for the buildup of this process is determined from the solutions of the energy and balance equations of the number of particles (for electrons).

V. P.

A68-20175 *

LARGE SUPERCONDUCTING MAGNETS FOR M.H.D.

Z. J. J. Stekly (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: CRYOGENIC ENGINEERING: PRESENT STATUS AND FUTURE DEVELOPMENT; CRYOGENIC ASSOCIATION OF JAPAN, INTERNATIONAL CRYOGENIC ENGINEERING CONFERENCE, 1ST, TOKYO AND KYOTO, JAPAN, APRIL 9-13, 1967, PROCEEDINGS.

Conference sponsored by the Cryogenic Association of Japan and the Tokyo Electric Power Co.

London, Heywood-Temple Industrial Publications, Ltd., 1968, p. 112-118. 10 refs.

Research supported by Avco Corp. and NASA.

Brief review of the criteria required for stable superconducting magnets and an examination of the present state of the art in MHD type superconducting magnets. A discussion of the problems and the degree of scale-up required from the present state of the art in MHD type superconducting magnets is given. The problems of steady-state refrigeration requirements, margin of stable operation and emergency system shutdown are treated. M.G.

A68-20399

MAGNETOHYDRODYNAMIC COUPLING USING A LIQUID METAL FLYWHEEL.

L. K. Martinson.

(*Magnitnaia Gidrodinamika*, vol. 1, Oct.-Dec. 1965, p. 85-90.)

(*Magnetohydrodynamics*, vol. 1, Oct.-Dec. 1965, p. 54-57. 8 refs. Translation.

Description of a scheme for a coupling with a liquid-metal flywheel rotating under the action of crossed electric and magnetic fields. The steady-state problem of the motion of a conducting fluid in an axial magnetic field in a channel with rotating cylindrical electrodes is solved with allowance for the effect of the nonconducting end plates. M.F.

A68-20403

LIQUID-METAL MAGNETOHYDRODYNAMIC GENERATORS AT LARGE MAGNETIC REYNOLDS NUMBERS.

Iu. M. Mikhailov.

(*Magnitnaia Gidrodinamika*, vol. 1, Oct.-Dec. 1965, p. 113-119.)

(*Magnetohydrodynamics*, vol. 1, Oct.-Dec. 1965, p. 72-75. Translation.

The induction equation is solved in the region of large magnetic Reynolds numbers for flat and cylindrical channels with a working section of finite length. The fluid velocity field is assumed given. The magnetic field distribution depends both on the magnetic Reynolds number and on the geometry of the working section.

(Author)

A68-20598

STATUS OF CONTROLLED THERMONUCLEAR RESEARCH.

C. M. Van Atta (California, University, Lawrence Radiation Laboratory, Berkeley, Calif.).

IN: ADVANCED PROPULSION CONCEPTS; PROCEEDINGS OF THE FOURTH SYMPOSIUM, PALO ALTO, CALIF., APRIL 26-28, 1965.

Symposium sponsored by the Office of Scientific Research of the U.S. Air Force and the United Aircraft Corp.

New York, Gordon and Breach, Science Publishers, Inc., 1966, p. 257-278.

AEC-sponsored research.

General discussion of the current theoretical understanding, experimental achievement, and technological accomplishments in the study of controlled nuclear fusion. The areas treated are:

- (1) the difficulties involved in carrying out relevant experiments with diagnostic results which are relatively free of ambiguity,
- (2) the theoretical understanding of the stability of real plasmas, taking into account the finite orbit sizes of the particles, the finite resistivity of the plasma, and many other elements of realism,
- (3) the realization of application of minimum-B configurations in suppressing gross hydromagnetic instabilities in magnetic mirror confinement, and (4) the achievement of a stable and rigid E-layer, even though still weak (1%) as compared with that required for field reversal. A brief description and discussion of the work at the Astron experimental facility is given. M.G.

A68-20734

CHEMICAL ENERGY ENGINES.

A. G. Hammit (TRW Systems Group, Redondo Beach, Calif.).

Advanced Energy Conversion, vol. 7, Feb. 1968, p. 191-200. 5 refs.

Examination of the relations governing the conversion of chemical energy to mechanical or electrical energy. The free-energy change of the chemical reaction limits the upper temperature

at which heat can be supplied to a heat engine. It is pointed out that the use of a heat engine in a power conversion system does not degrade the performance unless it sets a limit on the maximum temperatures below that imposed by the chemical reaction. R.B.S

A68-20829

THE EFFECT OF THE BULK GAS ON THE ELECTRICAL CONDUCTIVITY OF POTASSIUM-SEEDED NON-EQUILIBRIUM PLASMAS.

H. I. Ellington (Robert Gordon's Technical College, Aberdeen, Scotland).

Journal of Physics, Part D - British Journal of Applied Physics, vol. 1, Feb. 1968, p. 189-192.

Discussion of recently published experimental results of Ellington and Raiph (1966), showing the effect of the diluent gas on the electrical properties of alkali-metal-seeded rare-gas plasmas in terms of an extension of the two-temperature conductivity theory first proposed by Kerrebrock (1962). The theory developed is used to give an estimate, based on experiment, of the effect on K-He, K-Ne and K-Ar plasmas of varying the diluent pressure from 0.01 to 20 atm. It is concluded that argon and neon seeded with potassium (or cesium) appear to be suitable for use as the working fluid in an MHD generator operating at pressures up to 10 or 20 atm, but that helium appears to be unsuitable as a diluent at pressures above 2 or 3 atm. M.F.

A68-22530

THERMODYNAMICS OF MHD ENERGY CONVERSION.

Harold M. DeGroff (Purdue University, School of Aeronautical and Engineering Sciences, Lafayette, Ind.) and Richard F. Hoglund (Purdue University, Aerospace Sciences Laboratory, Lafayette, Ind.).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 419-472; Discussion, Helmut Burkhart and Ralph Roberts (U.S. Navy, Office of Naval Research, Washington, D.C.), p. 472-475. 69 refs.

Assessment of the accuracy to which the performance of MHD energy conversion devices can be predicted. Both open-cycle and closed-cycle linear MHD generators are discussed. The recent progress made in open-cycle generators, with combustion reactions serving as the heat source, is described. Equilibrium thermodynamics is used to determine the theoretical performance of these generators. Particular attention is given to the loss mechanisms at the edges of field regions and through the wall and electrode boundary layers. Existing experimental results are compared with the theoretical predictions. Major engineering problems are pointed out and discussed. P.v.T.

A68-22531

NON-EQUILIBRIUM MODES OF MHD CONVERTERS.

Ian Fells (Newcastle-upon-Tyne, University, Dept. of Chemical Engineering, Newcastle-upon-Tyne, England).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 477-499; Discussion, J. M. Jenkins (Martech Consultants, Ltd.) and G. Klein (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Marcoussis, Essonne, France), p. 499, 500. 23 refs. Discussion in English and French.

Discussion of various approaches to problems of MHD electric-power generation, with reference to nonequilibrium modes. The reaction zones of hydrocarbon flames exhibit a marked departure from equilibrium and, associated with this, ionization levels one

05 ENERGY CONVERSION

million times greater than the predicted equilibrium levels. Phased combustion aimed at promoting this effect can lead to systems in which seed material is unnecessary. Oscillating combustion systems operating at both low and high frequencies lead to periodic high ionization levels with a low time-averaged temperature. Combustion-driven detonations can be maintained in various modes; the spinning mode seems particularly useful for MHD power generation. In addition to lowering the time-averaged temperature, the operation of pulsed systems makes possible the generation of alternating rather than direct current. The freezing of equilibrium during expansion can lead to high conductivity at lower temperatures; such an effect is applicable to closed as well as open cycle systems. F.R.L.

A68-22534

POTENTIALITIES OF DIRECT ELECTRO-FLUID DYNAMIC ENERGY CONVERSION PROCESSES FOR POWER GENERATION.

Hans Von Ohain and Frank Wattendorf.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 541-561. 11 refs.

Discussion of current research on electrofluid dynamics (EFD) conversion, whereby the fluid dynamic energy of a working medium containing ions or charged colloids is transformed into electrical energy by passing through an electrostatic field. EFD processes are characterized by low current density and high voltage. While the power density is lower than that indicated for magnetofluid dynamics, the power-to-weight ratio may still prove favorable, due to the lack of need for heavy magnetic equipment. A review is given of recent studies of the fundamental relationships between aerothermodynamic and electrical performance characteristics, including the effects of physicochemical properties of the working medium, basic configurations of electrodes and the conversion section, and scaling and similarity laws. M.G.

A68-22535

PERFORMANCE CHARACTERISTICS OF ELECTRO-FLUID DYNAMIC ENERGY CONVERSION PROCESSES EMPLOYING VISCOUS COUPLING.

Maurice O. Lawson.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 563-580.

Determination of the performance characteristics of electrofluid-dynamic energy conversion processes employing viscous coupling between the neutral molecules and the electrically charged particles. The convergence efficiency and other electrofluiddynamic performances values (including the effects of the physical properties of the working medium, the influence of geometric parameters, and scaling) are studied. Very favorable power densities and stage efficiencies can be obtained with viscous-coupled electrofluiddynamic energy conversion processes where electrodes and channel configurations have low aerodynamic losses and where pressurized working gases, having the particular properties of low molecular weight and high dielectric strength, are utilized. M.G.

A68-22536

PERFORMANCE CHARACTERISTICS OF ELECTRO-BALLISTIC GENERATORS.

Siegfried Hasinger.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 581-601. 8 refs.

Discussion of the ballistic principle for the direct conversion of fluid dynamic energy into electric energy by using a gas flow to transport electric charges to a high electrical potential. In this case, the particles are first accelerated, and then their kinetic energy is used to carry the charges against the electric field. Ballistic generator performance is discussed, including characteristic voltage regime, particle velocity, charge-to-mass ratio, conversion length, elastic power concentration, dynamic pressure, and mass density of the particle flow. For a detailed numerical evaluation of ballistic generators, the basic equations are combined into one diagram by forming appropriate parameters. The principal magnitudes in these parameters - i.e., voltage, current density, conversion length, power density, entrance field strength, or mass density of the particle flow are discussed. A more exact electric-field distribution in the conversion region of a ballistic generator for the case of plane-parallel electrodes (no radial field lines) is derived. The ballistic generator with radial electric field is also treated. M.G.

A68-22537

ION GENERATION BY CORONA DISCHARGE FOR ELECTRO-FLUID ENERGY CONVERSION PROCESSES.

Maurice O. Lawson.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 603-612.

Investigation of the generation of unipolar ions or charged colloids in high-speed gaseous working media used in electrofluiddynamic energy conversion processes. Corona discharge configurations enabling simultaneous employment of more than one working medium - i.e., vapor and gas for the formation of charged colloids - are presented. It is shown that current values produced in a high-speed flow by the corona phenomena are dependent on the gas speed and physical properties of the gas or working medium. Scaling considerations show that the amount of current produced varies linearly with both the pressure and also the diameter of the electrode configuration, rather than the square of the diameter. It is demonstrated that numerical solutions based on simplifying assumptions can properly predict the order of magnitude of ion current production as well as colloid current production. M.G.

A68-22538

EXPERIMENTAL TECHNIQUES IN ELECTRO-FLUID DYNAMIC ENERGY CONVERSION RESEARCH.

Michael Hawes.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 613-629; Discussion, E. Knoernschild (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Porz-Wahn, West Germany), p. 629, 630.

Discussion of experimental equipment and testing methods for electro-fluid dynamic power generation. Closed-cycle or simulated closed-cycle operation is treated. Included are investigations of fluid-dynamic energy transfer from a supersonic jet of high molec-

ular weight to a recirculating gas of low molecular weight, the mass flow of the supersonic jet being small in comparison to that of the recirculating gas. Methods of generation of ions or charged colloids of one polarity employing corona discharge are discussed. The effects of the geometric configuration of the conversion section are considered, as well as the problem of the scaling characteristics. The effects of variation in pressure in the conversion section are noted and the equipment and instrumentation for high-voltage, low-current, power measurements are described. The theoretical results of the analysis presented indicate that a power density of 750 watts/cm² can be obtained. In an attempt to improve the overall effect of the process, two-loop operation is suggested, energy transfer being accomplished with the aid of mixing by means of ejectors. M.G.

A68-22539

THERMODYNAMICS OF THERMOELECTRIC CONVERSION.

V. Ferro (Torino, Politecnico, Turin, Italy).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 633-649. 12 refs.

Study of experimental thermoelectric phenomena and their interpretation and correlation, according to the thermodynamic theory of irreversible processes. The case of an ideal thermoelectric generator operating at optimum efficiency or at maximum electric power output conditions is investigated. The Thomson and Peltier effects are also considered. B.B.

A68-22540

HIGH-TEMPERATURE THERMOELECTRIC MATERIAL LIMITATIONS.

C. M. Kelley and G. C. Szego.

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 651-676; Discussion, Simon Thomas, p. 676, 677. 11 refs.

Determination of the limits set by materials properties to the application of thermoelectric energy conversion. It is found that melting points and vapor decomposition pressure begin to restrict the choice of materials just below 2000°K. This restriction becomes continually more severe through the next 1000°K. Solubility of contact materials does not set any specific limit, but it makes the use of volatile or liquid encapsulated material unlikely at the highest temperatures proposed. B.B.

A68-22541

FUEL CELL REACTANT PROPERTIES.

R. G. H. Watson (Ministry of Defence, Royal Naval Scientific Service, Admiralty Materials Laboratory, Dorset, England).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 681-706; Discussion, K. R. Williams (Shell Research, Ltd., Thornton Research Centre, Chester, England), p. 706, 707. 54 refs.

The fuel cell is considered as a chemical energy converter, and the components which contribute to its important dimensions are discussed. The performance of the fuel cell system is related to the properties of its reacting components and the contribution they

make to the various sources of energy loss. The values of some of these properties are readily accessible, such as the density and energy content of a fuel, which help to determine the maximum specific energy content of a fuel cell system. Other properties, which related to energy losses, and determine cell efficiency from which the actual specific energy content is determined, may be a function of a particular cell design. For instance the amount of polarization due to slow fuel electrode reaction will involve a wide range of properties including those of electrode and fuel materials, at the cell conditions used. The reactant properties that are useful in fuel cell system design are derived in this discussion and concern the fuel, oxidant and exhaust products, and the electrodes and electrolyte. Appropriate values are tabulated and used to illustrate factors in cell design. Areas of apparent ignorance are discussed in relation to the need for further work. (Author)

A68-22545 *

THERMODYNAMICS AND APPLICATIONS OF BIOELECTROCHEMICAL ENERGY CONVERSION SYSTEMS.

Michael G. Del Duca and John M. Fuscoe (NASA, Office of Advanced Research and Technology, Biotechnology and Human Research, Washington, D.C.).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 811-838; Discussion, F. M. Cohn, p. 838, 839.

Consideration of applications of the results of biochemical research and development to bioelectrochemical energy conversion (the process of converting the chemical free energy of biologically catalyzed reactions to electrical energy). Current progress is reviewed. A synopsis is given of suggested applications, ranging from the use of bioelectric currents to identify toxic materials, and to power cardiac pacemakers implanted in the human heart, to the generation of electric power in remote areas of the world. F.R.L.

A68-22547

PHOTOVOLTAIC CELLS WITH CONCENTRATORS [CELLULES PHOTOVOLTAIQUES AVEC CONCENTRATEURS].

Pierre Leclerc (Compagnie Générale de Télégraphie Sans Fil, Centre de Recherches Physico-Chimiques, Puteaux, France).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 863-871. In French.

Study of the influence of the development and operational parameters of a photodiode on its efficiency in a photovoltaic generator. The influence of the series resistance on the efficiency of the generator was investigated. Studies were also made of means of improving the performance of these cells. F.R.L.

A68-22548

DEVELOPMENT OF A THERMOPHOTOVOLTAIC CONVERTER [REALISATION D'UN CONVERTISSEUR THERMOPHOTOVOLTAIQUE].

A. Fortini, Ph. Bauduin, and P. Sibillot (Laboratoire Central des Industries Electriques, Fontenay-aux-Roses, Hauts-de-Seine, France).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

05 ENERGY CONVERSION

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 873-896. 14 refs. In French.

Theoretical analysis of the influence of the geometrical and electrical parameters defining a photovoltaic cell with reference to the efficiency of conversion of luminous energy into electric power. The basic theory is briefly reviewed. The spectral adaptation of the cell is studied. Theoretical predictions and experimental data are compared. It is shown to be possible to develop a thermophotovoltaic converter of very acceptable efficiency, of the order of 15%.

F. R. L.

A68-22549

P-I-N STRUCTURES FOR CONTROLLED SPECTRUM PHOTOVOLTAIC CONVERTERS.

David C. White (Massachusetts Institute of Technology, Cambridge, Mass.) and Richard J. Schwartz (Energy Conversion, Inc., Cambridge, Mass.).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. DeGroff, R. F. Hoglund, J. Fabri, T. F. Nagay, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARD-ograph 81), 1967, p. 897-921; Discussion, Emil Kittl (U.S. Army, Electronics Command, Electronic Components Laboratory, Fort Monmouth, N.J.), p. 921, 922. 23 refs.

Review of the present status of thermophotovoltaic (TPV) research, with investigation of the advantages of p-i-n photovoltaic structures for use with high-intensity controlled spectrum sources, to establish the important characteristics of such devices in a TPV system. An edge-irradiated p-i-n structure is analyzed, and marked advantages are found because of higher output voltages, reduced series resistance, and improved collection efficiencies. This type of structure also possesses potential advantages for the conversion of high-energy particles to electrical energy.

F. R. L.

A68-22803

STUDY OF THE END EFFECTS AND THE EFFECT OF THE INDUCED MAGNETIC FIELD IN AN MHD GENERATOR [ETUDE DES EFFETS D'EXTREMITÉ ET DU CHAMP MAGNETIQUE INDUIT, DANS UN GENERATEUR MHD].

L. Dragos (București, Universitatea, Bucharest, Rumania). International Journal of Engineering Science, vol. 5, Dec. 1967, p. 919-938. 19 refs. In French.

Study of the expansion to infinity of an electrically conducting fluid in a tube of constant rectangular cross section having two of the electrodes applied in the region $x \geq 0$ of the horizontal walls and the vertical isolating walls. The flow takes place in the presence of an external magnetic field applied only in the electrode region. The mathematical problem, presented in the terms of the distributions, contains two parameters R_M and $\lambda = R_M R_H$. By using three Green's functions, an iterative process is developed from which all the approximations of the functions of current, electric potential, and magnetic field can be determined.

M. F.

A68-22960

RECENT DEVELOPMENTS IN CLOSED-CYCLE PLASMA MHD SYSTEMS.

William D. Jackson (Illinois, University, Chicago, Ill.). Power Reactor Technology and Reactor Fuel Processing, vol. 10, Spring 1967, p. 136-147. 99 refs.

Discussion of the current status, recent developments, and prospects of the closed-cycle plasma MHD system. The difficulty of attaining nonequilibrium ionization is pointed out. Recent developments in nonequilibrium theory and measurements, conformal mapping and electrode leakage, flow and nonequilibrium ionization, and closed-cycle experiments are described. The cycle performance and preliminary economics of closed-cycle plasma MHD systems are discussed, the prospects for closed-cycle plasma MHD systems are analyzed, and the reactor requirements and the possibilities of attaining them are reviewed.

M. F.

A68-23120

EXPERIMENTAL STUDY OF NONEQUILIBRIUM IONIZATION IN A LINEAR MHD GENERATOR.

Bert Zauderer (General Electric Co., Missile and Space Div., Space Sciences Laboratory, King of Prussia, Pa.).

AIAA Journal, vol. 6, Apr. 1968, p. 701-707. 26 refs.

Results of a study to obtain, through magnetically induced ionization, a plasma in which the electron temperature was significantly greater than the gas stagnation temperature. The MHD generator was mounted at the downstream end of a shock tube. Noble gases were shock-heated to static gas temperatures, corresponding to equilibrium electron densities n_e between 10^8 cm^{-3} and 10^{12} cm^{-3} . Results showed that an initial n_e of the order of 10^{11} cm^{-3} was required at the generator entrance to obtain significant magnetically induced ionization; if n_e was produced by preionization with an applied electric field, the preionization power requirement was 10% of the maximum generator power output. Electrode conduction losses controlled the minimum initial n_e requirement, the ionization growth rate in the generator, and the maximum generator power output. The rate of ionization growth in the freestream of the generator was in agreement with the predictions of a one-dimensional theory in which electron collisional ionization and recombination dominated the rate equations. The measured steady-state, electron densities in the generator were up to 1000 times greater than the corresponding values at the gas stagnation temperatures. The measurements were in general agreement with the theoretical predictions obtained from the electron energy equation and the Saha equation at the electron temperature.

(Author)

A68-23796

ONE-DIMENSIONAL FLOW OF A PLASMA IN A MHD ENERGY CONVERTER CHANNEL.

L. A. Vulis and M. K. Kusainov.

(Teplofizika Vysokikh Temperatur, vol. 5, July-Aug. 1967, p. 663-675.)

High Temperature, vol. 5, July-Aug. 1967, p. 594-604. 9 refs. Translation.

Analysis of the relations among the variables of a quasi-one-dimensional plasma flow in crossed electric and magnetic fields, in the case of very small magnetic Reynolds numbers. The results obtained for arbitrarily oriented j and E vectors and arbitrary values of the Hall parameter β are applied to a quantitative study of the processes taking place in the channel of an MHD generator.

V. P.

A68-23911

EFFECTS OF ELECTRODE AND BOUNDARY-LAYER TEMPERATURES ON MHD GENERATOR PERFORMANCE.

R. Kessler and R. H. Eustis (Stanford University, Stanford, Calif.). IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETOHYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 33-40. 10 refs.

USAF-supported research.

Evaluation of experiments performed in a combustion-driven MHD generator to determine the effects of electrode temperature and boundary-layer temperature on its performance. The generator was a single electrode pair guarded to avoid end effects by two electrode pairs both upstream and downstream. It was found that a generator configuration with hot electrodes downstream of the hot walls produced about six times the power of a generator configuration with cold electrodes downstream of cold walls. Electrode voltage drops, obtained from the sidewall probe data, were found to vary with load current, electrode temperature, and upstream wall temperature. Cathode voltage drops were higher than anode voltage drops, but the difference decreased with increasing electrode temperature and upstream wall temperature.

P. v. T.

A68-23914

SEGMENTED ELECTRODE EFFECTS IN MHD FLOWS WITH HALL CURRENTS.

P. W. Johnson (ARO, Inc., Arnold Air Force Station, Tenn.).
IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 53, 54.

Contract No. AF 40(600)-1200.

Derivation of formulas which may be used to quantitatively evaluate the effects of nonuniform distribution of currents in segmented-electrode MHD generators and accelerators. Particular attention is given to the case of finite-net axial current and the results are applicable to devices operating in the Hall or slant-wall modes. Expressions are given for the optimum value of the electrode-spacing parameter, the electrode size, and the dissipation along the streamlines. T.M.

A68-23919

OPERATION OF A 20 MW HALL GENERATOR.

L. E. Wright, J. B. Carson, Robert H. LaBounty (ARO, Inc., Arnold Engineering Development Center, Arnold Air Force Station, Tenn.), and Joseph Teno (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 78-84.

Contract No. AF 40(600)-1200.

Discussion of the operation of a 20-Mw Hall generator and associated equipment. Support equipment includes an oxidizer system, a fuel system, a cooling water system, a seeder system, an iron core magnet, a ballast, and an exhaust system, each of which is described in detail. The MHD generator, driven by a large rocket engine, was designed to deliver 2000 amp at a voltage level of 10,000 v. The system complexity requires a careful sequencing of subsystems during startup. Certain safety precautions and devices must be incorporated into the operation of such a facility for the protection of personnel and equipment. The control systems include protective devices which terminate a test should a malfunction occur. The handling and storage of fuel and oxidizer generate safety hazards to personnel. A review of both the operational and test instrumentation is presented. (Author)

A68-23920

TWO-TERMINAL CONNECTED OPEN CYCLE MHD GENERATORS.

Y. C. L. Wu, D. L. Denzel, S. Witkowski, R. V. Shanklin, III, U. Zitzow, J. Muehlhauser, P. Chang, E. S. Jett, and J. B. Dicks (Tennessee, University, Space Institute, Tullahoma, Tenn.).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 85-98. 12 refs.

Contract No. AF 33(615)-2691.

Presentation of experimental results of two-terminal operation of a 60° diagonal conducting wall generator and a Hall generator under identical gasdynamic channel entrance conditions and magnetic field configurations. The results of the overall performance of these generators are discussed, from open circuit to short circuit conditions as well as detailed measurements of the current distributions over individual electrodes and fluctuations in the Hall generator. In addition, high-speed motion pictures were obtained of the Hall generator electrode surfaces during operation. A number of corrections were applied to the simple one-dimensional theory to

take into account the influence of finite segmentation and a model for electrode current-dependent near-electrode sheath potentials. It was found that such corrections enable the prediction of the whole operation range (from open to short circuit) in the cases of the 45° and 60° generators, but that the agreement is still not ideal when it concerns the Hall generator. The Hall generator produces consistently less power than predicted by the theory, and the discrepancy increases as open circuit is approached. (Author)

A68-23921

EXPERIMENTAL STUDIES WITH AN ARC-DRIVEN HALL MHD GENERATOR WITH STRONG MHD INTERACTION.

J. E. Klepeis and J. G. Olin (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 99, 100.

USAF-sponsored research.

Results of experimental studies of the performance of an arc-driven Hall MHD generator at values of the MHD interaction parameter (ratio of Lorentz to inertia forces) up to 1.8 and at theoretical Hall coefficients greater than approximately 3. Tests involved channels with both a circular and rectangular cross section. Channel stall is shown to be the major power-limiting effect, and some solutions to performance constraints are discussed. T.M.

A68-23925

AN EXPERIMENTAL STUDY ON WATER-COOLED METAL ELECTRODES OF MHD GENERATOR.

H. Ogiwara, T. Tamaoki, and K. Mawatari (Tokyo Shibaura Electric Co., Ltd., Toshiba Central Research Laboratory, Kawasaki, Japan).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 108, 109.

Characteristics of a water-cooled MHD generator, especially performances of electrodes, were studied experimentally. The voltage drops on the surface of water-cooled metal electrodes were deduced from the voltage-current characteristic curves plotted for the case of an externally applied electric field. Probes were inserted through generator channel to determine the profile of electric field, and the voltage drop on the electrode surface was resolved into cathode-drop and anode-drop. The different properties of cathode-drop and anode-drop were discussed, and the mechanism of current supply from the electrodes was considered. (Author)

A68-23929

CLOSED CYCLE M.H.D. EXPERIMENTS WITH A LARGE BLOW-DOWN FACILITY.

E. Bertolini, M. Gasparotto, P. Gay, and R. Toschi (Comitato Nazionale per l'Energia Nucleare, Laboratorio Conversione Diretta, Frascati, Italy).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETO-HYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 130-141. 7 refs.

Description of the CNEN MHD experimental facility (an alkali-seeded noble-gas blow-down loop), and discussion of two series of

05 ENERGY CONVERSION

MHD experiments performed at this facility. The installation is designed to minimize the adverse effects on the generator performance of alkali-metal vaporization and mixing with noble gas, mixture purity level, and plasma insulation from ground, which are not strictly related to the plasma behavior in the MHD duct. The measurements of Faraday and Hall voltages and plasma electrical conductivity in a wide range of the Hall parameter are compared with theory, taking into account the effects of electrode voltage drops, finite segmentation, wall-to-ground loop leakages, and electro-thermal instabilities when nonequilibrium ionization is expected.

R. B. S.

A68-23931

PRELIMINARY EXPERIMENTS ON THE STRIATED-FLOW INDUCTION SYNCHRONOUS MHD GENERATOR.

J. Milewski, J. Stanco, and J. Samulski (Polska Akademia Nauk, Instytut Maszyn Przepływowych, Gdańsk, Poland). IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETOHYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers. Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 166-168. 8 refs.

Discussion of an attempt to produce an adequate striated flow in an induction-synchronous MHD generator. The method chosen is to create this flow by nonthermal ionization of an inert seeded gas in the internal induced electric field of the generator. It is assumed that the striated flow can be created in the form of a series of conducting rings generated by pulsing an ignition coil with high-frequency ac and that the high-frequency ring discharges can be changed to low-frequency constricted-ring discharges flowing along the duct with the gas. It is concluded that more definite results will be obtained only when the experimentation is conducted at higher working-gas pressure.

R. B. S.

A68-23932

SOME ASPECTS ON THE OPTIMIZATION OF AN INDUCTIVE MHD CONVERTER.

G. Carpetis, A. Gann, and W. Peschka (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart, West Germany). IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETOHYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers. Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 169, 170.

Demonstration that the performance advantages of the one-wave induction MHD converter may be balanced by the friction losses in the flow channel and the inductive power requirements of the compensating poles. Calculations obtained by use of a computer program based on a two-dimensional analysis show that the overall efficiency and the power factor of the one-wave converter do not exceed those of the uncompensated multiwave converter.

R. B. S.

A68-24323 **

THE FUEL CELL PROBLEM.

Ernst M. Cohn (NASA, Washington, D.C.).

Institute of Electrical and Electronics Engineers, International Convention and Exhibition, New York, N.Y., Mar. 18-21, 1968, Paper. 4 p.

Discussion of the historical background, development, and operation of fuel cells, with special attention devoted to the materials, applications, and engineering problems of fuel cells using hydrogen and oxygen (pure or as air). These problems involve the minimization of the amounts of precious platinum and palladium catalysts, the optimization of electrodes and cell structures, and the problem of high cost per kilowatt.

V. Z.

A68-24403

A RADIANTLY HEATED RADIOISOTOPE-POWERED THERMIONIC GENERATOR.

J. G. DeSteele and J. S. Holmgren (McDonnell Douglas Corp., Donald W. Douglas Laboratories, Richland, Wash.).

IN: THERMIONIC CONVERSION SPECIALIST CONFERENCE, PALO ALTO, CALIF., OCTOBER 30-NOVEMBER 1, 1967, CONFERENCE RECORD.

Conference sponsored by the Electron Devices Technical Professional Group of the Institute of Electrical and Electronics Engineers. New York, Institute of Electrical and Electronics Engineers, Inc., 1967, p. 120-129. 9 refs.

Description of a Pm^{147} thermionic generator in which a cylindrical array of planar diodes is mounted in a support structure so that each electrically and thermally isolated emitter faces a central heat source. In this generator, an incandescent radioisotope fuel block radiates heat to the surrounding emitter shoes. High-temperature thermal insulation is used between the diodes to minimize heat transfer to the support structure. This arrangement allows the use of redundant arrays of highly reliable solar energy thermionic (SET) diodes in generators of 100 watts or more electric power output. The use of a monolithic low-power-density fuel block permits a very practical fuel block design.

P. v. T.

A68-24872

ELECTRODE VOLTAGE DROP IN A SEEDED PLASMA.

Toshitsugu Hara and Motokazu Uchida (Hitachi, Ltd., Mechanical Engineering Research Laboratory, Tokyo, Japan).

Japanese Journal of Applied Physics, vol. 7, Feb. 1968, p. 163-169. 7 refs.

Measurement of the potential distribution in a duct, in the presence of an externally applied voltage. The gas flowing through the duct was a propane/oxygen combustion gas seeded with K_2CO_3 powder. The voltage drop is found to increase with the current density, but to become independent of it above a critical current density. This critical current density and the voltage drop become smaller as the electrode temperature increases. It is concluded that the main causes of the voltage drop are the thin, cold gas layer near the electrode in the region of smaller current densities, and the arc column in the region above the critical current density.

M. G.

A68-25596

END REGION OF A SINGLE-LOAD CROSSCONNECTED M. H. D. GENERATOR.

W. T. Norris and J. B. Heywood (Central Electricity Generating Board, Research Laboratories, Leatherhead, Surrey, England).

Institution of Electrical Engineers, Proceedings, vol. 115, Apr. 1968, p. 555-561. 10 refs.

Theoretical, two-dimensional analysis of the end region of a single-load cross-connected MHD generator in which the duct cross section, fluid properties, and magnetic field are uniform. Infinitely fine segmentation of the cross-connected electrode system is assumed. With a single load connected between solid electrodes at each end of the generator, the analysis predicts infinitely high current densities and electric fields at the junction of the solid-electrode and cross-connected sections. It is shown that these infinite concentrations can be removed by using grading resistors near the ends, and the design of one arrangement of grading resistors is discussed.

(Author)

A68-25934

ENERGY CONVERSION WITH THE AID OF THE MAGNETO-CALORIC AND THE ELECTROCALORIC EFFECTS [ENERGIE-WANDLUNG MIT HILFE MAGNETOKALORISCHER UND ELEKTROKALORISCHER EFFEKTE].

W. Peschka (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und elektrische Antriebe, Stuttgart, West Germany).

Deutsche Gesellschaft für Luft- und Raumfahrt, Symposium über Energieversorgung im Weltraum II, Munich, West Germany, Mar. 14, 1968, Paper. 18 p. 5 refs. In German.

Study of the conversion of the mechanical energy of ferromagnetic, paramagnetic, and diamagnetic materials in magnetic fields to electrical energy by means of an MHD converter. Also inves-

tigated is the conversion of the mechanical energy of a dielectric material to electrical energy by applying the electrocaloric effect. It is shown that only under certain conditions can a diamagnetic material be used in such an energy-conversion process. Two energy-loss mechanisms - ohmic loss and eddy-current loss - are considered for the case of the conversion of the mechanical energy of the magnetic materials. R. B. S.

A68-26140**INTERACTION OF A TRAVELING MAGNETIC FIELD WITH RIGID CONDUCTING SPHERES OR CYLINDERS.**

Richard J. Thome (U.S. Army, Electronics Command, Electronic Components Laboratory, Fort Monmouth, N. J.).
IEEE, Proceedings, vol. 55, Dec. 1967, p. 2116-2122. 12 refs.
Contract No. AF 33(615)-3489.

The case of a rigid conducting sphere or cylinder that travels with uniform velocity relative to a two-dimensional, primarily transverse magnetic field with sinusoidal variation in space and time is analyzed to determine the electromechanical characteristics of the interaction. Interest is centered on conductors with diameters small relative to the wavelength of the applied field. For the sphere, an exact solution is not tractable by standard techniques; hence, a method is utilized in which the force is approximated by one of its components. The results are verified by (1) applying the approximation to the analogous case of a cylinder and comparing the result with the exact solution to that case, (2) comparing the limit of the approximate solution for the sphere with the result obtained by assuming the magnetic Reynolds number to be small, and (3) determining the net time-average force of electromagnetic origin experimentally for comparison with the predictions of the theory. The latter were carried out for the cylinder as well as the sphere over a range of magnetic Reynolds numbers ($sr_m = \mu_0 \sigma \omega D^2$) from 0.4 to 20. In the course of the work, a method is also utilized in which the original "skin effect" problem is reduced to a problem involving interacting low sr_m components and the force is found via the techniques of lumped parameter electromechanics. Situations which may be modeled using the results of this study include holdup or separation of a highly conducting liquid phase from a two-phase flow in heat transfer apparatus as a result of the application of a magnetic field gradient or the energy conversion in a liquid metal magnetohydrodynamic induction machine with a two-phase working fluid. (Author)

A68-27085 #**EXPERIMENTAL INVESTIGATION OF THE CURRENT DENSITY DISTRIBUTION IN A SIMULATED MHD GENERATOR.**

Fred W. Fischer (Institut für Plasmaphysik GmbH, Garching, West Germany).
AIAA Journal, vol. 6, May 1968, p. 894-900. 12 refs.
EURATOM-supported research.

In an MHD generator with segmented electrodes, the Hall effect prevents a homogeneous current distribution in the region of the electrodes. The results of calculations of the current density distribution in an inert gas alkali metal plasma using simplifying assumptions were compared with measurements made in a simulated argon-potassium generator. The gas in the generator channel had a temperature of about 2000°K and a pressure of 1.1 atm. The potassium content was 0.22% by weight. The gas velocity did not exceed 130 m/sec, and the magnetic-field strength was held below 4500 gauss. The emf was simulated by applying an electric field of about 15 v across each electrode pair. Measurements of the intensity distribution of the potassium resonance lines permitted conclusions to be drawn with respect to the distribution of electron temperature and thus current density. In general, qualitative agreement with theory was found. The most pronounced deviation from theory occurred near the electrodes, particularly along the insulator between electrodes. The potential distribution measured along the insulator wall was consistent with light-intensity measurements. (Author)

A68-27110 #**ELECTRODE-SIZE EFFECTS IN AN MHD GENERATOR WITH NON-UNIFORM ELECTRICAL CONDUCTION.**

M. Mitchner (Stanford University, Dept. of Mechanical Engineering,

Stanford, Calif.), D. A. Oliver (Santa Clara, University, Dept. of Mechanical Engineering, Santa Clara, Calif.), and J. R. MacDonald.
AIAA Journal, vol. 6, May 1968, p. 948, 949. 5 refs.
Contract No. AF 33(615)-67-C-1127.

Outline of the use of techniques formulated by two of the authors (Oliver and Mitchner - 1967) to study the effect of electrode size on the performance of an MHD generator with nonuniform electrical conductivity. When the effects of nonuniform conductivity are considered, the internal impedance of a segmented MHD generator becomes sensitive to electrode size; a low-conductivity layer near the wall is seen to increase the optimum electrode size. B.B.

A68-27639**DEVELOPMENT OF A THERMALLY REGENERATIVE SODIUM-MERCURY GALVANIC SYSTEM. II - DESIGN, CONSTRUCTION, AND TESTING OF A THERMALLY REGENERATIVE SODIUM-MERCURY GALVANIC SYSTEM.**

I. J. Groce and R. D. Oldenkamp (North American Rockwell Corp., Aerospace and Systems Group, Atomics International Div., Research and Technology Div., Canoga Park, Calif.).
IN: REGENERATIVE EMF CELLS; AMERICAN CHEMICAL SOCIETY, MEETING, 149TH, SYMPOSIUM, DETROIT, MICH., APRIL 8, 9, 1965, PAPERS.

Symposium sponsored by the Division of Industrial and Engineering Chemistry and the Division of Fuel Chemistry of the American Chemical Society.

Washington, D.C., American Chemical Society (Advances in Chemistry Series No. 64), 1967, p. 43-52. 8 refs.

Research sponsored by the North American Aviation Independent Research and Development Program.

Description of the design, construction, and testing of a thermally regenerative energy conversion system using galvanic cells in which liquid-metal streams of sodium and mercury are allowed to combine electrochemically to produce an alloy plus electrical energy. The sodium amalgam stream from the cell battery must be converted to a sodium-rich amalgam and mercury. This is done in the regenerator which distills and separates a mercury fraction, condenses the mercury vapor, cools both streams and recirculates them to the cells. A test loop was built and operated to study these regeneration processes. Two tests were made with the regeneration loop connected to single-matrix thermally regenerative alloy cells - one for 116 hr and the other for 1197 hr. The cell internal resistance did not change during either test, indicating that the cell materials are compatible with the working fluids under flow conditions. T.M.

A68-27650**CHEMICALLY REGENERATIVE, FUEL CELL SYSTEMS.**

John M. Matson (Esso Research and Engineering Co., Linden, N. J.).

IN: REGENERATIVE EMF CELLS; AMERICAN CHEMICAL SOCIETY, MEETING, 149TH, SYMPOSIUM, DETROIT, MICH., APRIL 8, 9, 1965, PAPERS.

Symposium sponsored by the Division of Industrial and Engineering Chemistry and the Division of Fuel Chemistry of the American Chemical Society.

Washington, D.C., American Chemical Society (Advances in Chemistry Series No. 64), 1967, p. 277-291. 46 refs.

Outline of the history of the development of chemically regenerative fuel-cell systems - devices that have long been studied in the hope of circumventing the problems of direct electrochemical reaction of fuels and air. It is concluded that at present regenerative systems are not competitive with direct fuel cells. Works discussed range from Borchers (1894) and Nernst (1913) to Posner (1955) and Austin et al. (1965). B.B.

A68-29145**SECONDARY POWER CONVERSION SYSTEMS.**

S. D. Diamond (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Secondary Power Systems Branch, Santa Monica, Calif.).

IN: SPACE SYSTEMS TECHNOLOGY.

Edited by R. D. Heitchue, Jr.

New York, Reinhold Book Corp., 1968, p. 210-257.

Discussion of the functional subsystems - i.e., energy source, power conversion, heat rejection, and power conditioning and dis-

05 ENERGY CONVERSION

tribution - that constitute a secondary power-conversion system. Closed-cycle dynamic modes of conversion including the Brayton cycle, the Rankine cycle using a variety of condensable working fluids, and the Stirling cycle are discussed. Considerations in the design and selection of secondary power systems, including power requirements, environmental effects, and power system selection, are described. Power systems designed for short duration and emergency power, low-power long-duration systems, moderate-power long-duration systems, and high-power extended duration systems are discussed. M.G.

A68-29186

ELECTROMAGNETIC CALCULATION OF AN APPROXIMATE MODEL OF AN INDUCTION MHD MACHINE WITH ALLOWANCE FOR A SECONDARY CIRCUIT [ELEKTROMAGNITNYI RASCHET PRIBLIZHENNOI MODELI INDUKTSIONNOI MGD-MASHINY S UCHETOM VTORICHNOI TSEPI].

Ia. Ia. Valdmanis and Ia. Ia. Lielpeter.

Magnitnaia Gidrodinamika, vol. 4, Jan.-Mar. 1968, p. 114-122. 5 refs. In Russian.

Derivation of analytical expressions for the current-density distribution, electromagnetic induction, power density, and joule losses, both along and across the working channel of an induction MHD machine. The expressions are obtained with the aid of an approximate model of the machine. A numerical and experimental investigation of the electromagnetic-field distribution demonstrates the effectiveness of the model proposed. The merits and drawbacks of various stator windings are examined. V.P.

A68-29187

END EFFECT IN CONDUCTION MHD MACHINES IN THE CASE OF BRANCHING OF A PORTION OF THE CURRENT ALONG THE CHANNEL [KONTSEVOI EFFEKT V KONDUKTSIONNYKH MGD-MASHINAKH PRI OTVETVLENII CHASTI TOKA VDOL' KANALA].

Iu. A. Birzvalk.

Magnitnaia Gidrodinamika, vol. 4, Jan.-Mar. 1968, p. 129-137. In Russian.

Discussion of the potential distribution in the channel of a liquid-metal conduction MHD machine in the case where the flow area consists of several electrically series-connected subchannels. The problem of calculating the electromagnetic pressure in such a channel is also examined. It is shown that the potential difference gives rise to parasitic bypass currents along the tubes interconnecting the individual subchannels. V.P.

A68-29309

AN INDUCTION GENERATOR EXPERIMENT.

J. P. Barach and E. J. Sommer, Jr. (Vanderbilt University, Physics Dept., Nashville, Tenn.).

Plasma Physics, vol. 10, May 1968, p. 563-566. 5 refs. Grant No. AF AFOSR 287-66.

Description of an experiment performed to study an induction MHD generator system. In the induction generator, plasma currents flow freely, electromagnetically inducing currents in the output coil. The obvious advantage of such a system is the absence of electrodes. The disadvantages include low efficiency and the need for operation with a pulsating plasma in order to obtain rapid flux variations. It is pointed out, however, that an induction device can be of interest when a pulsed hot plasma source is available. In the experiment described a hard-core pinch discharge is used to produce a cylindrically expanding blast wave. A dc magnetic field exists in the axial direction, so that circumferential currents are induced in the moving plasma. M.M.

A68-29598

INFLUENCE OF THE ELECTRICAL CONDUCTIVITY TENSOR ON THE FLOW IN A GENERATOR WITH FINITE ELECTRODES [INFLUENCE DU TENSEUR DE CONDUCTIVITE ELECTRIQUE SUR L'ECOLEMENT DANS UN GENERATEUR A ELECTRODES FINIES].

Lazar Dragoş (Bucureşti, Universitatea, Bucharest, Rumania). *Cambridge Philosophical Society, Proceedings*, vol. 64, Apr. 1968, p. 549-557. 8 refs. In French.

Study of the influence of the electrical conductivity tensor on the motion of a fluid in a MHD generator, under the conditions shown in a preceding work. The problem is also formulated in terms of the theory of distributions and the system of equations which determines the functions $\Psi = \psi + \gamma$ and $\phi = \varphi + \varphi_e$ depends on two parameters λ and ν (equal to $\omega\tau$). Due to the Hall current, the problem is no longer asymmetrical in the variable y , as in the first case, and it therefore has to be separated into an asymmetric and a symmetric problem. By developing a method of successive approximations as against two parameters, it can be shown that the exact solution of the problem can be obtained. M.M.

A68-29729

A UNIFIED THEORETICAL DESCRIPTION OF THERMIONIC CONVERTER PERFORMANCE CHARACTERISTICS.

D. R. Wilkins (General Electric Co., Pleasanton, Calif.).

Journal of Applied Physics, vol. 39, Apr. 1968, p. 2452-2458. 28 refs.

AEC-supported research.

Fundamental principles of molecular chemistry, statistical mechanics, and plasma physics are used to derive theoretical output current and efficiency characteristics of vapor thermionic converters. The results are obtained in terms of basic physical parameters which describe the converter electrodes and interelectrode gas and are in good agreement with corresponding experimental measurements for a broad range of converter operating conditions. The analysis has practical applications for converter physics studies, converter performance evaluations, and thermionic power-plant design. (Author)

A68-29901

PERFORMANCE OF THERMOCHEMICALLY DRIVEN MHD CONVERTERS.

Shimshon Frankenthal (American Science and Engineering, Inc., Cambridge, Mass.).

AIAA Journal, vol. 6, June 1968, p. 993-1000. 8 refs.

A slug model for the MHD pulse generator is presented, and the assumptions inherent in it are discussed. In the limit where magnetic diffusion can be ignored, it is shown that the model is governed by a third-order system of differential equations, which is presented cast in a dimensionless form and analyzed. The dimensionless parameters that determine the performance are defined and employed in cataloging the various modes of operation of the system. It is shown that unit conversion efficiency is possible for a wide range of combinations of the system parameters. The role of the load parameter (the ratio of the load resistance to the total circuit resistance) in optimizing the performance is discussed. In a particular mode of operation, the compression of the magnetic field by the slug gives rise to the possibility of operating the device at a reasonable conversion efficiency even though the initial (imposed) magnetic field is small. The excitation requirements in this nearly "self-excited" mode are determined by the inductive component of the load. (Author)

A68-30712

OPTIMUM MHD GENERATOR WITH CHANNEL OF CONSTANT CROSS SECTION.

A. S. Pleshanov and P. P. Lazarev (Akademii Nauk SSSR, Energeticheskii Institut, Moscow, USSR).

(Teplofizika Vysokikh Temperatur), vol. 5, Sept.-Oct. 1967, p. 907-912.)

High Temperature, vol. 5, Sept.-Oct. 1967, p. 806-810. Translation.

An exact and complete solution is obtained in a quasi-linear approximation with small magnetic Reynolds numbers to the variational problem of the optimization of a linear conduction MHD generator with a channel of constant cross-sectional area S . Optimization is achieved by obtaining a given power N with minimum generalized volume Δ (the parameter of MHD interaction), which

is equivalent to obtaining the maximum of N with a given value of Δ . The working substance is a perfect inviscid electrically conducting gas of zero thermal conductivity, whose electric conductivity σ_{\perp} is an arbitrary function of temperature, pressure, and magnetic and electric field strengths. The maximum indices of optimum MHD are compared with those of an MHD generator with fixed parameters. (Author)

A68-30774

A PULSED MAGNETOHYDRODYNAMIC GENERATOR WITH A SUPERCONDUCTING MAGNETIC SYSTEM.
V. A. Kirillin, A. E. Sheindlin, E. I. Asinovskii, V. V. Sychev, V. B. Zenkevich, A. M. Maksimov, and V. A. Al'tov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).
(Akademiia Nauk SSSR, Doklady, vol. 177, Nov. 1, 1967, p. 77-80.)
Soviet Physics - Doklady, vol. 12, May 1968, p. 1059-1061. Translation.

Experimental verification of the theory of a pulse MHD generator employing a superconducting magnetic system. The design and schematic diagram of the generator used in the experiments are described, and a graph showing the distribution of the magnetic induction along the channel axis is given. Tests in which the magnetic system was disconnected from the generator supply sources and the supply of liquid helium in the cryostat was not replenished showed that the magnetic field intensity remained at a constant level. V. P.

A68-31226 #

THERMODYNAMIC ANALYSIS OF A CLOSED CYCLE WITH AN MHD GENERATOR AND AN MHD COMPRESSOR [TERMODINAMICHESKII ANALIZ ZAMKNUTOGO TSIKLA S MGD-GENERATOROM I MGD-KOMPRESSOROM].

V. L. Iakimenko (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR).
Teplofizika Vysokikh Temperatur, vol. 6, Mar.-Apr. 1968, p. 306-314. 5 refs. In Russian.

Determination of the effect of Joule losses in an MHD generator and an MHD compressor on the efficiency of a closed cycle of thermal-to-electric energy conversion, in which electrical conductivity is maintained by nonequilibrium ionization. The Faraday variant of an MHD channel is discussed, assuming a one-dimensional gas flow and a small magnetic Reynolds number. The Joule losses increase with pressure and reduce sharply the efficiency of the cycle. The parameters for which the cycle has a positive efficiency are determined. V. Z.

A68-31227 #

ELECTROGASDYNAMIC GENERATOR [ELEKTROGAZODINAMICHESKII GENERATOR].

A. T. Belevtsev, Iu. S. Bortnikov, N. S. Lidorenko, G. F. Muchnik, and I. B. Rubashov.
Teplofizika Vysokikh Temperatur, vol. 6, Mar.-Apr. 1968, p. 320-326. 6 refs. In Russian.

Theoretical and experimental investigation of the operation of a device converting the potential or kinetic energy of a moving dielectric medium into electric power. A system of direct conversion of thermal energy into electric power is examined, and some preliminary experimental data are discussed. The analytical and experimental results indicate that the "electrogasdynamic generator" should be able to compete with other existing energy converters. V. P.

A68-31228 #

PECULIARITIES OF MAGNETOGASDYNAMIC CONVERTERS EMPLOYING THE RANKINE CYCLE [OB OSOBNOSTIYAKH USTANOVOK S MAGNITOGAZODINAMICHESKIMI PREEBROZOVATELAMI, RABOTAIUSHCHIKH PO TSIKLU RENKINA].
S. A. Mokrushin, R. V. Radchenko, V. G. Stepanov, and A. G. Sheinkman (Ural'skii Politehnicheskii Institut, Sverdlovsk, USSR).
Teplofizika Vysokikh Temperatur, vol. 6, Mar.-Apr. 1968, p. 327-332. 6 refs. In Russian.

Comparative thermodynamic analysis of MHD generators employing the Brayton and Rankine cycles. It is shown that in the case of nonequilibrium ionization the Rankine cycle will convert at higher MHD-channel Mach numbers than the Brayton cycle. Working fluids particularly suited for use in the Rankine cycle are examined. V. P.

A68-31864

ELECTROMECHANICAL DEVICES FOR ENERGY CONVERSION AND CONTROL SYSTEMS.

Vincent Del Toro (New York, City University, City College, School of Engineering and Architecture, New York, N.Y.).
Englewood Cliffs, N.J., Prentice-Hall, Inc., 1968. 635 p. 39 refs. \$13.75.

This text offers an integrated treatment of the theory and operating principles of electromechanical energy-conversion devices. The formulation and development of the essential principles of voltage generation and torque production are treated in a manner which allows for a unified treatment of both ac and dc machines. The means by which torque is produced in such physically different machines as the induction motor, the synchronous machine, and the dc machine are examined and illustrated. Electromechanical components frequently found in control systems are analyzed, including two-phase servomotors, ac tachometer generators, synchros, and induction resolvers. The dynamic behavior of machines is examined both individually and as part of a system. The essential features associated with direct energy-conversion methods are also included, and a comparison of the relative merits of direct energy conversion with the electromechanical method is given. R. B. S.

A68-32685 #

PRESENT SITUATION AND FUTURE PROSPECTS OF CONTROLLED NUCLEAR FUSION [DEN KONTROLLERADE KÄRNFUSIONENS NULÄGE OCH FRAMTIDSUTSIKTER].
Bo Lehnert (Kungl. Tekniska Högskolan, Stockholm, Sweden).
FOA Reports, vol. 1, July 1967, p. 1-14. 28 refs. In Swedish.

Discussion of power production based on controlled fusion of deuterium and tritium nuclei, in order to meet the demands for a strongly enhanced energy consumption. For the controlled release of fusion energy in a reactor, a fully ionized gas of heavy hydrogen has to be kept at a temperature of the order of millions of degrees Kelvin during times of the order of seconds. A self-sustained fusion reaction is therefore only possible if the ionized gas (the plasma) is prevented in a very efficient way from getting into contact with the walls of the reaction chamber. The most promising method in this respect is to use a magnetic field in the shape of a "magnetic bottle" which confines the plasma. In addition to this, methods are required for heating the plasma to the necessary temperature range, as well as a number of technical arrangements for the generation of the magnetic field and the development of the reaction chamber. At the present stage, the fusion problems are mainly the particle losses from the magnetic bottle and the stability of the equilibrium state of the confined plasma. However, there now exist methods for the suppression of some of the most important instabilities in devices where the particle losses have a good chance of being kept at a low level. It is considered possible that thermonuclear fusion research will lead to success within the foreseeable future. P. v. T.

A68-33438

POTENTIAL IN PERFORMANCE IMPROVEMENTS IN AIR BREATHING PROPULSION.

Ernest C. Simpson (USAF, Systems Command, Research and Technology Div., Aero Propulsion Laboratory, Turbine Engine Div., Wright-Patterson AFB, Ohio).
IN: AVIATION AND SPACE: PROGRESS AND PROSPECTS; PROCEEDINGS OF THE ANNUAL AVIATION AND SPACE CONFERENCE, BEVERLY HILLS, CALIF., JUNE 16-19, 1968.

New York, American Society of Mechanical Engineers, 1968, p. 343-350.

Discussion of various parameters (specific fuel consumption, thrust-to-weight ratio, thrust per pound of air being achieved, and

05 ENERGY CONVERSION

use life of the engine) as they apply to current state-of-the-art for air breathing propulsion. Recent improvements in the field are discussed as they relate to reliability, maintainability, and cost.

M. G.

A68-36891

DIRECT ENERGY CONVERSION.

S. L. Soo (Illinois, University, Urbana, Ill.).

Englewood Cliffs, N. J., Prentice-Hall, Inc., 1968, 346 p. \$12.50.

This book covers the basic concepts of direct energy conversion. Following a review of fundamental concepts in thermodynamics, electrochemical effects and fuel cells are discussed with attention drawn to the reversible cell and the ideal fuel cell, the efficiency of a fuel cell, and losses in a fuel cell. Thermionic systems are considered next, with emphasis on the ideal and actual efficiency of a thermionic energy converter. The component effects of thermoelectricity are discussed, including the Seebeck, Peltier, Thomson, Fourier, and Joule effects. The exchange of energy due to displacement of dipoles is then considered, and cases of interaction of thermoelectricity with a magnetic field are treated. The conversion of kinetic or pressure energy of a fluid to electricity by means of MHD devices is discussed, as well as the relationship between fusion plasma generators and direct energy conversion. Criteria for selecting direct-energy-conversion devices for a given application are presented, and general classifications of these devices are made from the points of view of irreversible thermodynamics and the transport of charge carriers.

R. B. S.

A68-37062

THE PLASMA MHD POWER GENERATOR.

Thomas R. Brogan (Colorado State University, Dept. of Mechanical Engineering, Fort Collins, Colo.).

IN: ADVANCES IN PLASMA PHYSICS. VOLUME 1.

Edited by Albert Simon and W. B. Thompson.

New York, Interscience Publishers, Division of John Wiley and Sons, Inc., 1968, p. 227-330, 80 refs.

Discussion of plasma MHD devices for power generation. The electrical properties (electrical conductivity and Hall coefficient) of seeded gases are considered, and the effort to obtain nonequilibrium ionization in an induced electric field is examined. Developments in the design, performance, and technology of MHD generators are described, with primary emphasis on the combustion-driven MHD generators on which most of these developments occurred - including rocket-driven MHD generators such as the Mark V Prototype and the LORHO Pilot 20 MW generators.

R. A. F.

A68-37310

ELECTROSTATIC PROBE MEASUREMENTS IN FLOWING NaK-SEEDED ARGON.

Harris B. McKee and M. Mitchner (Stanford University, Dept. of Mechanical Engineering, Stanford, Calif.).

AIAA Journal, vol. 6, Aug. 1968, p. 1587-1589. 15 refs. Contract No. AF 49(638)-1695.

Experimental study of the current-voltage characteristics of closed-cycle MHD generators using a cooled cylindrical probe in a low-velocity atmospheric-pressure argon flow seeded with NaK (90% K by weight). Probe experiments were conducted in the upstream plenum of an inert-gas MHD generator operating with arc-heated argon. It was found that the current collected by the probe depended strongly on the probe temperature, which ranged from 350 to 1000 K, and that above 450 K the collected currents were considerably larger than those predicted by present probe theory or by thermionic emission.

R. E. L.

A68-38740

HIGH TEMPERATURE PLASMAS AND CONTROLLED FUSION [LES PLASMAS A HAUTE TEMPERATURE ET LA FUSION CONTROLLEE].

M. Trocheris (EURATOM and Commissariat à l'Energie Atomique, Groupe de Recherches sur la Fusion, Fontenay-aux-Roses, Hauts-de-Seine, France).

IN: STATES OF MATTER UNDER THE EXTREME EFFECTS OF VERY HIGH AND VERY LOW TEMPERATURES, AND VERY HIGH AND VERY LOW PRESSURES; INSTITUT FRANÇAIS DES COMBUSTIBLES ET DE L'ENERGIE, INTERNATIONAL CONFERENCE, 7TH, PARIS, FRANCE, APRIL 4-8, 1967, PROCEEDINGS [ETATS DE LA MATIERE SOUS LES EFFETS EXTREMES DES TRES HAUTES ET TRES BASSES TEMPERATURES, TRES HAUTES ET TRES BASSES PRESSIONS; INSTITUT FRANÇAIS DES COMBUSTIBLES ET DE L'ENERGIE, JOURNEES INTERNATIONALES, 7TH, PARIS, FRANCE, APRIL 4-8, 1967, PROCEEDINGS].

Edited by Marcel Veron.

Paris, Institut Français des Combustibles et de l'Energie, 1968, p. 27-34; Discussion, Marcel Veron (Conservatoire National des Arts et Metiers, Paris, France), N. Kurti (Oxford University, Oxford, England), and J. L. Delcroix (Paris, Université, Faculté des Sciences, Orsay, Essonne, France), p. 35. In French.

Discussion of high-temperature plasmas and attempts to achieve controlled thermonuclear fusion. If all the types of preparatory experiments are included, densities experimented with range from 10^9 to 10^{17} cm⁻³, while the temperatures run from 10^5 to 10^9 K. In spite of these large spreads, plasmas from fusion laboratories have important common properties. In particular, they are classic plasmas: their phase density is always much smaller than the limiting density h^{-3} which corresponds to a Fermi gas at absolute zero, h being Planck's constant. The dimensionless parameter $n\lambda^3_D$, the number of the particles in a cube with a side equal to the Debye length, is much greater than unity, which implies that the plasma is an assemblage of relatively independent particles, the positions of which in phase space are weakly correlated, and which are displaced approximately according to the effect of a common electromagnetic field.

F. R. L.

A68-39715

EFFECTS OF ELECTRODE AND BOUNDARY-LAYER TEMPERATURES ON MHD-GENERATOR PERFORMANCE.

R. Kessler and R. H. Eustis (Stanford University, Dept. of Mechanical Engineering, Stanford, Calif.).

AIAA Journal, vol. 6, Sept. 1968, p. 1640-1646. 10 refs. USAF-supported research.

Investigation of energy transfer in the MHD generator from the working fluid to an external load by means of electrodes. Experiments are performed in a combustion driven generator to determine the effects of electrode temperature on its performance. The electrodes are held at three temperature levels of 775, 1475, and 11,635 K, by controlling individual cooling circuits. Two electrode boundary-layer temperature profiles were investigated: one resulting from a hot (2400 K) upstream wall, and the other resulting from a cold (750 K) water-cooled plate that replaced the normal upstream electrode wall. Probes are installed in the insulator side wall between the center pair of electrodes to measure the voltage profile in the gas. It is found that (1) electrode temperature is an important factor in determining the MHD generator performance, (2) the cathode voltage drops are caused by surface-sheath effects and gasdynamic effects, and (3) the voltage drops are primarily gasdynamic and may be roughly predicted from calculation based upon integration of an equilibrium conductivity profile through the boundary layer to a point one Debye length from the electrode surface.

Z. W.

A68-39717

MHD GENERATOR IN TWO-TERMINAL OPERATION.

Y. C. L. Wu, J. B. Dicks, D. L. Denzel, S. Witkowski (Tennessee, University, Space Institute, Tullahoma, Tenn.), R. V. Shanklin, III, U. Zitzow (J. B. Dicks and Associates, Tullahoma, Tenn.), P. Chang, and E. S. Jett.

AIAA Journal, vol. 6, Sept. 1968, p. 1651-1657. 13 refs. Contract No. AF 33(615)-2691.

Experimental results of a two-terminal connected, 60° diagonal conducting wall (DCW) generator and a Hall generator under identical channel entrance conditions. The governing equations for two-terminal connected, MHD generators were derived under the assumption of homogeneous electrical properties and with corrections, including the finite size of electrodes. A comparison of the outlined

theory with the experimental results shows that other losses not included in the theory can be represented by a factor reducing the induced emf of the generator. (Author)

A68-39722

ELECTRICAL CHARACTERISTICS OF A LINEAR, NONEQUILIBRIUM, MHD GENERATOR.

Bert Zauderer and Eric Tate (General Electric Co., King of Prussia, Pa.).

(SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETOHYDRODYNAMICS, 8TH, STANFORD UNIVERSITY, STANFORD, CALIF., MARCH 28-30, 1967, PRESENTATIONS, p. 89-99.)

AIAA Journal, vol. 6, Sept. 1968, p. 1685-1694. 18 refs. Navy-supported research.

Experiments were performed to isolate the primary causes of the Hall voltage reduction in large Hall parameter ($\omega\tau$), linear MHD generators. The MHD generator working fluid was either shock heated xenon or a shock heated 9.2% carbon monoxide - 90.8% xenon gas mixture. The $\omega\tau$ values in the generator ranged from 1 to 10. The transverse current level per electrode was varied for 10 amp at which Lorentz force and nonequilibrium effects were negligible to 140 amp at which both effects were appreciable. At all current levels, optical observations show that the current in the generator is concentrated in streamers. However, at the lower current levels it was possible to obtain reasonably good agreement with a uniform nonequilibrium plasma, MHD generator theory. At higher current levels the experimental Hall voltage was below the values predicted by this theory. The deviation increased with increasing Lorentz force. It was optically observed that nonuniform electrode conduction sharply increased the current density and hence the Lorentz force near the electrodes. Thus it is concluded that in the present experiments the Lorentz force is the primary factor in reducing the Hall voltage. (Author)

A68-39723 **

VARIABLE-VELOCITY MHD INDUCTION GENERATOR WITH ROTATING-MACHINE INTERNAL ELECTRICAL EFFICIENCY.

David G. Elliott (California Institute of Technology, Jet Propulsion Laboratory, Propulsion Research and Advanced Concepts Section, Pasadena, Calif.).

AIAA Journal, vol. 6, Sept. 1968, p. 1695-1702. 5 refs.

A traveling-wave, MHD induction generator with varying fluid velocity between inlet and exit can have the same internal electrical efficiency as a rotating induction generator. The fraction of electric retarding work converted to electric output at each station in the flow channel is $(1+s)^{-1}$, where s is the local slip $(U - U_g)/U_g$ between the velocity of the fluid U and the velocity of the zero-crossing of the magnetic field wave U_g . To produce the rotating-machine efficiency, the product of magnetic field amplitude, wave velocity, and flow channel width is held constant from inlet to exit. The local slip can be freely chosen for maximum electric output from the fluid in the presence of friction, and the inlet magnetic field can be selected for maximum output after winding and end losses. An efficiency of 0.63 is found possible with a 325-kW lithium generator. (Author)

A68-39724

OPTIMIZATION STUDIES ON OPEN-CYCLE MHD GENERATORS.

C. Carter and J. B. Heywood (Central Electricity Generating Board, Research Laboratories, Leatherhead, Surrey, England).

AIAA Journal, vol. 6, Sept. 1968, p. 1703-1711. 9 refs.

An optimization theory that predicts the variation of thermodynamic properties, duct shape, and electrical loading along an MHD generator for minimum duct length, duct surface area, or duct volume is developed. The model is based on the one-dimensional flow equations including heat transfer and friction, and the analysis is developed for a fluid with arbitrary dependence of density, enthalpy, electrical conductivity, and mobility on temperature and pressure. Four types of electrical loading of the generator are considered - the segmented-electrode Faraday generator; and the cross-connected generator, first with constant cross-connection angle and multiple load connections; then with a single load; and

finally with constant cross-connection angle and with single load. This theory is then applied to the design of an open-cycle MHD generator for a 2000-MW power plant. Numerical results for these four different types of generator are calculated with a computer program and compared, with particular emphasis on the loading parameter variation. It is concluded that the additional constraints of constant cross-connection angle and single load do not significantly affect the overall generator performance, although they do modify the parameter variation along the duct. (Author)

A68-39726

SOME DIAGNOSTIC TECHNIQUES USEFUL FOR MHD-GENERATOR PLASMAS.

R. Wienecke (Institut für Plasmaphysik GmbH, Garching, West Germany).

AIAA Journal, vol. 6, Sept. 1968, p. 1724-1727. 12 refs.

The plasma in an MHD generator is mainly defined by its electron density n_e , its electrical conductivity σ , the temperatures of the gas and the electrons T_g and T_e , its velocity v , and the value of the Hall coefficient $\omega\tau$. Various diagnostic methods have been developed in recent years to determine and clarify the behavior of such generators, which are described. (Author)

A68-40538

THE EFFECT OF LOCAL NON-EQUILIBRIUM IONIZATION IN A SEGMENTED ELECTRODE MHD GENERATOR.

M. G. Haines (London, University, Imperial College of Science and Technology, Physics Dept., London, England).

Plasma Physics, vol. 10, Aug. 1968, p. 787-797. 18 refs.

Study of the achievement of a high effective electrical conductivity and hence high power densities in closed-cycle MHD power generation. The effect of local nonequilibrium ionization in a segmented electrode MHD generator is considered. It is shown that when the electrical conductivity is proportional to the local ohmic heating, through both being proportional to the local nonequilibrium electron density, a segmented MHD duct behaves poorly at large Hall parameter. In fact, the ratio of Hall electric field to Faraday electric field is then less than $1/4$. Methods of overcoming this effect are discussed. M.G.

A68-41161

MHD POWER GENERATION USING AN RF-GENERATED NONEQUILIBRIUM PLASMA.

J. R. Dworschak and H. E. Brandmaier (Curtiss-Wright Corp., Wood-Ridge, N.J.).

AIAA Journal, vol. 6, Oct. 1968, p. 2021-2023.

Study of the use of a highly nonequilibrium plasma generated by inductively-coupled rf electric fields, in an MHD power generator operated at a subatmospheric pressure and a high effective Hall parameter but with a moderate magnetic field. Further studies must be made to develop more sophisticated diagnostic techniques for the measurement of rf-generated plasmas and to fully evaluate the potential of these techniques in MHD devices. R.M.

A68-41217 *

MATERIALS RESEARCH PROBLEMS IN THE DIRECT CONVERSION OF THERMAL RADIATIVE AND CHEMICAL ENERGY INTO ELECTRICITY.

Fritz Wald and Martin Weinstein (Tyco Laboratories, Inc., Waltham, Mass.).

IN: ENERGISTIC MATERIALS: ENERGY TO THE BENEFIT OF AEROSPACE AND MANKIND; SOCIETY OF AEROSPACE MATERIAL AND PROCESS ENGINEERS, NATIONAL SYMPOSIUM AND EXHIBIT, 13TH, CHICAGO, ILL., MAY 7-9, 1968, PROCEEDINGS.

North Hollywood, Calif., Western Periodicals Co. (SAMPE Science of Advanced Materials and Process Engineering Proceedings.

Volume 13), 1968, p. 337-368. 64 refs.

Contracts No. NAS 5-9149; No. N 00014-66-C-0147.

Evaluation of direct energy conversion methods such as thermoelectricity, solar cells, thermionics, and fuel cells, which are presently in a state of development where their practical and commercial

05 ENERGY CONVERSION

use for the solution of various specialized power supply systems is possible. A number of problems, particularly in materials, are however still hindering the most effective use of such devices. The general mechanisms of electric-energy production in the four cases are discussed. Recent research results are considered. P.v.T.

A68-41271

INVESTIGATION OF THE INFLUENCE OF THROTTLING ON THE EFFICIENCY OF A RANKINE CYCLE WITH AN MHD GENERATOR [ISSLEDOVANIIE VLIYANIYA DROSSELIROVANIYA NA K. P. D. TSIKLA RENKINA S MGD-GENERATOROM].

V. A. Ovcharenko, P. P. Orlov, and S. M. Chernyshev (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

Teplotfizika Vysokikh Temperatur, vol. 6, July-Aug. 1968, p. 595-598. 12 refs. In Russian.

Thermodynamic analysis of an MHD generator employing the Rankine cycle, for the case where mercury, lithium, or potassium is used as the working fluid. In the case of mercury, it is shown that in the superheated vapor region, the cycle efficiency is practically independent of throttling. This makes it possible to select the upper pressure of the cycle without considering the channel pressure. For potassium and lithium, throttling is found to lead to a decrease in efficiency. V. P.

A68-41272

CLOSED-LOOP CYCLE COMPOSED OF AN MHD GENERATOR AND A COMPRESSOR WITH A HEAVY-GAS FLOW [ZAMKNUTYI TSIKL-MGD-GENERATOR I KOMPRESSOR S POTOKOM TIAZHELOGO GAZA].

V. L. Iakimenko (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR).

Teplotfizika Vysokikh Temperatur, vol. 6, July-Aug. 1968, p. 607-614. 10 refs. In Russian.

Analysis of a converter of thermal into electric energy operating in a closed-loop cycle. Cycles are examined in which the working fluid, after passing through an MHD generator and a cooler, is compressed by means of the energy released by the generator or, in the case of a jet-type compressor, by means of an accelerated flow of a gas heavier than the working fluid. Since the compressor operation involves consumption of thermal rather than electric energy, the efficiency of a cycle incorporating a jet-type compressor decreases moderately with increasing Joule and hydraulic losses, and can still be as high as 10 to 15% in the case of losses for which a converter employing a compressor using electric energy supplied by the generator will exhibit a negative efficiency. V. P.

A68-41790

INVESTIGATION OF PLASMA EXPANSION IN A UNIFORM FIELD AND SHOCK FORMATION DUE TO A MAGNETIC BARRIER.

Yasunori Miyoshi and Yukio Okamoto (Nagoya Institute of Technology, Nagoya, Japan).

Japanese Journal of Applied Physics, vol. 7, Aug. 1968, p. 927-935. 15 refs.

Research sponsored by Nagoya University.

Investigation of the influence of the initial parameters on the behavior of a plasma expanding along a uniform guide field, and consideration of the processes whereby the kinetic energy of the plasma flow is converted to thermal energy by a shock wave due to a magnetic barrier. The longitudinal expansion of a plasma in a uniform guide field is accompanied by a decrease in density and temperature. The temperature decrease is smaller than the density decrease. This seems to be in agreement with a model, which has been applied in the Bille en Tête experiment. A shock wave propagates in the upstream direction accompanying the temperature and density increase behind the shock front. This phenomenon is clearer in the case of a plasma with lower density and higher temperature. M. M.

A68-42500

MAGNETOHYDRODYNAMIC ENERGY CONVERSION.

R. J. Rosa (Avco Corp., Avco-Everett Research Laboratory,

Everett, Mass.).

New York, McGraw-Hill Book Co., 1968. 246 p. \$17.50.

This volume reviews the basic principles and practical aspects of MHD energy conversion for graduate students and engineers interested in applied MHD. Detailed explanations and derivations from first principles are avoided, although the principal characteristics of an MHD generator, the basic concepts, and the magnetic Reynolds numbers are treated. Ionization and conductivity are treated, and the basic equations and general features of fluid mechanics are described. Hall and ion slip effects are investigated with regard to the engineering consequences. Design considerations are noted, and practical applications such as rocket generators, cavity reactors, radiating power plants, and propellant-cooled propulsion systems in the aerospace field are discussed. The appendices give transport properties in a multicomponent gas; calculated curves of conductivity and Hall parameters, magnetic strengths, constants; and a method for the calculation of the generator performance. R. M.

A68-42507

IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD. VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968. 1069 p. Members, \$25.; nonmembers, \$35.

CONTENTS:

CHAIRMAN'S MESSAGE. Paul Rappaport, p. 3.

ELECTROCHEMICAL POWER SOURCES.

HERMETICALLY SEALED NICKEL-CADMIUM BATTERIES FOR THE INITIAL DEFENSE COMMUNICATION SATELLITE PROGRAM/AUGMENTATION (IDCSP/A). Donald C. Briggs (Philco-Ford Corp., Palo Alto, Calif.) and Karl E. Preusse (Gulton Industries, Inc., Metuchen, N. J.), p. 13-18.

ADHYDRODE CONTROL OF Ni-Cd BATTERY CHARGING TO EVALUATE CHARGING METHODS. James D. Dunlop and R. W. Bounds (Communications Satellite Corp., Washington, D. C.), p. 19-24. 8 refs.

PROGRESS IN DEVELOPMENT OF HEAT-STERILIZABLE AG-ZN BATTERY. R. Lutwack (California Institute of Technology, Pasadena, Calif.), p. 25-31.

THEORETICAL EVALUATION OF HOT SPOT TEMPERATURE OF SILVER-ZINC BATTERIES. R. E. Meredith (Oregon State University, Corvallis, Ore.) and A. A. Uchiyama (California Institute of Technology, Pasadena, Calif.), p. 32-37. 7 refs.

HEAT GENERATION IN SEALED BATTERIES. Sidney Gross (Boeing Co., Seattle, Wash.), p. 38-46. 8 refs.

LEAD-ACID BIPOLAR BATTERY FOR MULTISECOND PULSE DISCHARGE. R. E. Biddick and R. D. Nelson (Gould National Batteries, Inc., Minneapolis, Minn.), p. 47-51. 5 refs.

ALLIS-CHALMERS CAPILLARY MATRIX FUEL CELL SYSTEMS - AN ADVANCED AEROSPACE POWER SOURCE. John L. Platner (Allis-Chalmers, Milwaukee, Wis.), p. 52-64.

SEPARATOR MATERIALS FOR LONG LIFE, HIGH RATE THERMAL CELLS. F. C. Arrance and M. J. Plizga (McDonnell Douglas Corp., Newport Beach, Calif.), p. 65-68.

OPERATING CHARACTERISTICS OF A LIQUID-COOLED CONTAINED-ELECTROLYTE LOW-TEMPERATURE FUEL CELL SYSTEM OVER A PERIOD OF 1500 HOURS. J. M. McKee, N. H. Hagedorn, and R. W. Easter (NASA, Lewis Research Center, Cleveland, Ohio), p. 69-75.

A LITHIUM/TIN CELL WITH AN IMMOBILIZED FUSED-SALT ELECTROLYTE - CELL PERFORMANCE AND THERMAL REGENERATION ANALYSIS. H. Shimotake and E. J. Cairns (Argonne National Laboratory, Argonne, Ill.), p. 76-91. 45 refs.

SOLAR ENERGY CONVERSION - TERRESTRIAL USES.

WORLDWIDE PROGRESS IN SOLAR ENERGY. F. E. Edlin (Arizona State University, Tempe, Ariz.), p. 92-97.

THE FUTURE OF POWER FROM THE SUN. P. E. Glaser (Arthur D. Little, Inc., Cambridge, Mass.), p. 98-104.

ENERGY GAP - DEC TEACHING. R. L. Bailey (Florida, University, Gainesville, Fla.), p. 105-111.

SOLAR ENERGY CONVERSION - SPACE USES.

STATUS OF THE CADMIUM SULFIDE THIN-FILM SOLAR CELL. F. A. Shirland (Clevite Corp., Cleveland, Ohio), A. F. Forestieri, and A. E. Spakowski (NASA, Lewis Research Center, Cleveland, Ohio), p. 112-115. 7 refs.

SOLAR CELL DEVELOPMENT SURVEY. E. L. Ralph (Textron Electronics, Inc., Sylmar, Calif.), p. 116-121. 10 refs.

ONE MEV ELECTRON DAMAGE IN SILICON SOLAR CELLS.

Richard L. Statler (U.S. Navy, Office of Naval Research, Washington, D.C.), p. 122-127.

RADIATION DAMAGE SHIELDING OF SOLAR CELLS ON A SYNCHRONOUS SPACECRAFT. Ramond C. Waddel (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 128-137. 16 refs.

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PARTICLE RADIATION EFFECTS ON SOLAR CELLS FOR NEAR-SUN MISSIONS. Robert G. Willis (Martin Marietta Corp., Denver, Colo.), p. 148-154. 23 refs.

ISOTOPIC HEAT SOURCES.

SNAP-19/NIMBUS B INTEGRATION EXPERIENCE. Arthur W. Fihelly (NASA, Goddard Space Flight Center, Greenbelt, Md.), Herbert N. Berkow (Hittman Associates, Inc., Columbia, Md.), and Charles F. Baxter (U.S. Atomic Energy Commission, NASA Goddard Space Flight Center, Greenbelt, Md.), p. 155-166. 6 refs.

THE KERNEL-HEATER CONCEPT FOR MULTIKILOWATT RADIOISOTOPE POWER. William Ruehle (Acrojet-General Corp., El Monte, Calif.), p. 167-180. 5 refs.

ON OPTIMIZED DESIGN OF RADIOISOTOPE CAPSULES FOR IMPACT. Carl A. Bodenschatz (Nuclear Materials and Equipment Corp., Apollo, Pa.), p. 181-188. 15 refs.

SNAP 29 NUCLEAR SAFETY. Dean M. Ruwe (Martin Marietta Corp., Baltimore, Md.), p. 189-193.

SNAP 29 HEAT SOURCE DESIGN AND DEVELOPMENT.

William W. Wachtl (Martin Marietta Corp., Baltimore, Md.), p. 194-199.

250-WATT RADIOISOTOPE THERMOELECTRIC GENERATOR WITH CAPABILITY FOR CONTROLLED INTACT REENTRY. William F. Ekern (Lockheed Aircraft Corp., Sunnyvale, Calif.), p. 200-209.

AN ADVANCED 2000 KWTH NUCLEAR HEAT SOURCE. Carl E. Walter, Norman J. Brown, Viktor E. Hampel, Edward W. McCauley, and Thomas P. Wilcox, Jr. (California, University, Livermore, Calif.), p. 210-221. 14 refs.

THERMOELECTRICS.

SEEBECK VOLTAGE PROBE FOR EXAMINATION OF THERMOELECTRIC ELEMENTS. J. Mueller and G. Farrior (Battelle Memorial Institute, Columbus, Ohio), p. 222-228.

ON THE EFFICIENCY OF SEGMENTED Si-Ge-PbTe THERMO-COUPLES. H. E. Bates and Martin Weinstein (Tyco Laboratories, Inc., Waltham, Mass.), p. 229-233. 6 refs.

APPLICATION OF FACTORIAL-DESIGNED EXPERIMENTS TO STUDY OF THERMOELECTRIC PROPERTIES OF LEAD TELLURIDE. D. B. Evans and J. W. McGrew (Martin Marietta Corp., Baltimore, Md.), p. 234-240.

FLAT-PLATE THERMOELECTRIC GENERATORS FOR SOLAR-PROBE MISSIONS. Valvo Raag, Robert E. Berlin (Radio Corporation of America, Harrison, N.J.), and William J. Bifano (NASA, Lewis Research Center, Cleveland, Ohio), p. 241-248. 19 refs.

PARTICULATE THERMAL INSULATIONS FOR THERMO-

ELECTRIC ENERGY CONVERSION DEVICES. J. O. Collins (Johns-Manville Corp., New York, N.Y.), p. 249-255.

HIGH TEMPERATURE MULTI-FOIL THERMAL INSULATION. M. L. Paquin (Thermo Electron Corp., Waltham, Mass.), p. 256-262.

MULTI-FOIL TYPE THERMAL INSULATION. W. D. DeWitt, N. C. Gibbon, and R. L. Reid (Union Carbide Corp., New York, N.Y.), p. 263-271.

A METHOD TO ARREST WEIGHT LOSS OF LEAD-TELLURIDE AT ELEVATED TEMPERATURES IN VACUUM. J. W. Killian (U.S. Naval Material Command, Annapolis, Md.), p. 272-276. 7 refs.

RANKINE CYCLE.

ELECTRICAL COMPONENT TECHNOLOGY FOR 1/4 TO 10 MEGAWATT SPACE POWER. A. E. King, J. B. Fanger (Westinghouse Electric Co., Lima, Ohio), and G. S. Leighton (U.S. Atomic Energy Commission, Washington, D.C.), p. 277-289. 13 refs.

RANKINE CYCLE SYSTEMS STUDIES FOR NUCLEAR SPACE POWER. J. H. Pitts and M. H. L. Jester (California, University, Livermore, Calif.), p. 290-298. 23 refs.

THE INFLUENCE OF HEAT-REJECTION RADIATOR MASS IN SPACE POWER SYSTEMS. Jacques M. Bonneville (NASA, Electronics Research Center, Cambridge, Mass.), p. 299-312. 74 refs.

THERMAL DESIGN PROCEDURES FOR SPACE RANKINE CYCLE SYSTEM BOILERS. J. R. Peterson (General Electric Co., Evendale, Ohio), R. N. Weltmann, and M. U. Gutstein (NASA, Lewis Research Center, Cleveland, Ohio), p. 313-328. 18 refs.

SNAP-8 POWER CONVERSION SYSTEM ASSESSMENT.

George M. Thur (NASA, Lewis Research Center, Cleveland, Ohio), p. 329-337. 9 refs.

A SNAP-8 BREADBOARD SYSTEM - OPERATING EXPERIENCE. J. N. Hodgson (Acrojet-General Corp., Azusa, Calif.) and R. P. Macosko (NASA, Lewis Research Center, Cleveland, Ohio), p. 338-351. 9 refs.

TWO-PHASE SPHEROIDAL HEAT TRANSFER TO MERCURY IN VORTEX FORCED CONVECTION. A. Koestel and R. J. Ziobro (TRW, Inc., Cleveland, Ohio), p. 352-362.

THE DOUBLE CONTAINMENT TANTALUM-STAINLESS STEEL SNAP-8 BOILER. L. W. Gertsma, P. A. Thollot, D. W. Medwid (NASA, Lewis Research Center, Cleveland, Ohio), and A. J. Sellers (Acrojet-General Corp., Azusa, Calif.), p. 363-369. 11 refs.

TECHNICAL ASSESSMENT OF A TURBINE POWERED HEATER. J. P. Norton (American Air Filter Co., Inc., St. Louis, Mo.), p. 370-375.

A SYSTEM TO DEMONSTRATE THE ZERO GRAVITY PERFORMANCE OF AN ORGANIC RANKINE CYCLE. T. J. Vild, F. H. Schubert, D. R. Snoko (TRW, Inc., Cleveland, Ohio), and C. L. Delaney (USAF, Systems Command, Wright-Patterson AFB, Ohio), p. 376-388. 12 refs.

THE ORGANIC RANKINE CYCLE. Gerald S. Leighton (U.S. Atomic Energy Commission, Washington, D.C.), p. 389-397. 19 refs.

THERMAL STABILITY DETERMINATION OF BIPHENYL AND THE EUTECTIC OF BIPHENYL AND PHENYL ETHER IN A RANKINE CYCLE SYSTEM. A. Warren Adam, Richard E. Niggemann, and Lowell W. Sibert (Sundstrand Corp., Rockford, Ill.), p. 398-406.

BRAYTON CYCLE.

2 TO 10 KILOWATT SOLAR OR RADIOISOTOPE BRAYTON POWER SYSTEM. John L. Klann (NASA, Lewis Research Center, Cleveland, Ohio), p. 407-415. 19 refs.

COMPARISON BETWEEN VAPOR CHAMBER AND CONDUCTING FIN BRAYTON RADIATORS. John W. Larson (General Electric Co., King of Prussia, Pa.) and James P. Couch (NASA, Lewis Research Center, Cleveland, Ohio), p. 416-426. 5 refs.

BRAYTON CYCLE ALTERNATOR-DRIVE TURBINE AERODYNAMIC STUDY. M. G. Kofskey, W. J. Nusbaum, and W. L. Stewart (NASA, Lewis Research Center, Cleveland, Ohio), p. 427-433. 8 refs.

AUTOMATIC TURBINE SPEED CONTROL FOR A 300 KW

05 ENERGY CONVERSION

CLOSED BRAYTON CYCLE SYSTEM. James M. Janis (Aerojet-General Corp., El Monte, Calif.), p. 434-437.

DEVELOPMENT OF A 1200-HERTZ ALTERNATOR AND CONTROLS FOR SPACE POWER SYSTEMS. B. D. Ingle and C. S. Corcoran (NASA, Lewis Research Center, Cleveland, Ohio), p. 438-447.

SMALL SPACE POWER SYSTEMS.

DEVELOPMENT OF A TWO WATT/LB RADIOISOTOPE FUELED SPACE THERMOELECTRIC GENERATOR. N. H. DesChamps and H. E. Rexford (Sanders Associates, Inc., Nashua, N.H.), p. 448-455.

RADIOISOTOPE THERMOELECTRIC GENERATOR DESIGN FOR VOYAGER SURFACE LANDER. Kenneth H. Dufrane and Wayne M. Brittain (Martin Marietta Corp., Baltimore, Md.), p. 456-463.

SNAP II RADIOISOTOPE THERMOELECTRIC GENERATOR. Wayne M. Brittain (Martin Marietta Corp., Baltimore, Md.), p. 464-468.

SNAP 29 SYSTEM DESIGN AND DEVELOPMENT. Martin R. Scheve (Martin Marietta Corp., Baltimore, Md.), p. 469-476.

APPLICATION OF HEAT PIPES TO SNAP 29. W. B. Bienert, S. Frank, R. Hannah, and J. T. Peters (Martin Marietta Corp., Baltimore, Md.), p. 477-486.

HEAT PIPE RADIATOR FOR SPACE POWER PLANTS. Richard W. Werner and Gustav A. Carlson (California, University, Livermore, Calif.), p. 487-503. 12 refs.

ELECTRICAL POWER SYSTEM DESIGN FOR A JUPITER SOLAR ELECTRIC PROPULSION MISSION. V. Truscello (Martin Marietta Corp., Baltimore, Md.) and R. Loucks (California Institute of Technology, Pasadena, Calif.), p. 504-521. 7 refs.

TRANSIT AND LUNAR PERFORMANCE OF THE SURVEYOR V-SOLAR PANEL ASSEMBLY. Robert K. Yasui (California Institute of Technology, Pasadena, Calif.), p. 522-528.

THE DEVELOPMENT OF A 28-VOLT 500-WATT THERM-IONIC POWER GENERATOR. W. E. Harbaugh, R. C. Turner, and R. W. Longsdorff (Radio Corporation of America, Lancaster, Pa.), p. 529-532.

LARGE SPACE POWER SYSTEMS.

NUCLEAR ORGANIC RANKINE/THERMOELECTRIC SYSTEMS. James M. Howard (North American Rockwell Corp., Canoga Park, Calif.), p. 533-538.

EVALUATION OF EXPANDED PYROLYTIC GRAPHITE RADIATORS FOR NUCLEAR SPACE POWER SYSTEMS. J. V. Coggi (McDonnell Douglas Corp., Santa Monica, Calif.) and J. Madsen (McDonnell Douglas Corp., Richland, Wash.), p. 539-548. 7 refs.

A DESIGN CONCEPT FOR A 30 WATTS PER POUND ROLLUP SOLAR ARRAY. N. F. Shepard, Jr. and K. L. Hanson (General Electric Co., Philadelphia, Pa.), p. 549-559.

THIN-FILM MULTIKILOWATT SOLAR ARRAYS. W. Luft and R. A. Boring (TRW Systems Group, Redondo Beach, Calif.), p. 560-570. 7 refs.

LUNAR SURFACE SOLAR ARRAY CHARACTERISTICS. R. Boring (TRW Systems Group, Redondo Beach, Calif.), p. 571-579. 7 refs.

LARGE SOLAR ARRAYS FOR MULTI-MISSION LUNAR SURFACE EXPLORATION. J. E. Boretz (TRW Systems Group, Redondo Beach, Calif.) and J. L. Miller (NASA, Marshall Space Flight Center, Huntsville, Ala.), p. 580-591. 9 refs.

DEVELOPMENT OF INTERCONNECTABLE SOLAR PANELS FOR LARGE-ARRAY SYSTEMS. Larry G. Chidester and Jerry A. Mann (Lockheed Aircraft Corp., Palo Alto, Calif.), p. 592-599.

METHODS FOR FABRICATING Cds THIN-FILM SOLAR CELL MODULES. A. F. Ratajczak (NASA, Lewis Research Center, Cleveland, Ohio), F. A. Blake, and M. R. Stahler (General Electric Co., Philadelphia, Pa.), p. 600-606.

SPACECRAFT ELECTRICAL POWER SYSTEM SELECTION.

DESIGN AND COMPARISON OF SECONDARY POWER SYSTEMS FOR ADVANCED SPACE VEHICLES. A. D. Tonelli (McDonnell Douglas Corp., Santa Monica, Calif.), p. 607-614.

RTG-SPACECRAFT INTERACTION CONSIDERATIONS FOR DEEP-SPACE PROBES. Robert D. McGarrigle, William J. Dixon, and Frank Ridolphi (TRW Systems Group, Redondo Beach, Calif.), p. 615-624. 6 refs.

POWER SYSTEM CONFIGURATIONS FOR EXTENDED SCIENCE MISSIONS ON MARS. M. Swerdling (California Institute of Technology, Pasadena, Calif.), p. 625-640. 8 refs.

ENERGY CONSERVATION METHODS APPLIED TO LUNAR SURFACE OPERATIONS. J. B. Kendrick (TRW Systems Group, Redondo Beach, Calif.), p. 641-646. 7 refs.

MULTIPLE OPERATING POINTS IN PHOTOVOLTAIC POWER SYSTEMS. Charles N. Bolton (NASA, Goddard Space Flight Center, Greenbelt, Md.) and Paul S. Nekrasov (Radio Corporation of America, Princeton, N.J.), p. 647-652.

POWER CONDITIONING.

LOW-VOLTAGE CONVERSION FROM PRIMARY AND SECONDARY SOURCES. E. R. Pasciutti (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 653-661.

COMPUTERIZED DESIGN OF DC/DC VOLTAGE CONVERTERS. Steve A. Kolenik (Nuclear Materials and Equipment Corp., Apollo, Pa.), p. 662-668.

POWER CONDITIONING FOR THERMOELECTRIC GENERATORS. Henry W. Gayek (General Electric Co., Philadelphia, Pa.), p. 669-679.

DIRECT SIMULATION OF A-C MACHINERY INCLUDING THE EFFECTS OF SPACE AND TIME HARMONICS. R. J. W. Koopman (Washington University, St. Louis, Mo.) and F. C. Trutt (U.S. Army, Mobility Equipment Command, Fort Belvoir, Va.), p. 680-688.

AN INDUCTOR ALTERNATOR ROTOR FOR SPACE APPLICATION. Jack L. McCabria (Westinghouse Electric Co., Lima, Ohio), p. 687-697. 6 refs.

MAGNETIC FORCE UNBALANCE AND FLUX DISTRIBUTION IN INDUCTOR ALTERNATORS. C. G. Kouba (Westinghouse Electric Corp., Lima, Ohio), p. 698-717.

COMMERCIAL APPLICATIONS OF ENERGY CONVERSION TECHNOLOGY.

COMMERCIAL APPLICATIONS OF ADVANCED BATTERY TECHNOLOGY. S. Lerner and W. E. Ryder (Gulton Industries, Inc., Metuchen, N.J.), p. 718-722.

IMPLANTABLE POWER SOURCES.

A RADIOISOTOPE-POWERED STIRLING ENGINE FOR CIRCULATORY SUPPORT. K. E. Buck, D. L. Forrest, and H. W. Tamai (Aerojet-General Corp., El Monte, Calif.), p. 723-732.

DEVELOPMENT OF A SIMPLIFIED STIRLING ENGINE TO POWER CIRCULATORY ASSIST DEVICES. W. R. Martini, R. B. Goranson, M. A. White, J. E. Noble, M. S. Mayer, and R. P. Johnson (McDonnell Douglas Corp., Richland, Wash.), p. 733-749.

DESIGN OF AN IMPLANTABLE, RANKINE-CYCLE RADIOISOTOPE POWER SOURCE. F. N. Huffman, R. J. Harvey, and S. S. Kitrilakis (Thermo Electron Corp., Waltham, Mass.), p. 750-757.

AN IMPLANTABLE ARTIFICIAL HEART POWER SOURCE. J. R. Lance and A. Selz (Westinghouse Electric Corp., Pittsburgh, Pa.), p. 758-764.

RADIOISOTOPE POWERED CARDIAC PACEMAKER - AN IMPLANTABLE THERMOELECTRIC SYSTEM. T. F. Hursen (Nuclear Materials and Equipment Corp., Apollo, Pa.), p. 765-772.

MINIATURE ISOTOPE THERMIONIC ELECTRICAL POWER SUPPLY. K. A. Gaepfer and J. G. DeSteele (McDonnell Douglas Corp., Richland, Wash.), p. 773-778.

TERRESTRIAL VEHICLE PROPULSION.

LOW POLLUTION HEAT ENGINES. D. J. Patterson and J. A. Bolt (Michigan, University, Ann Arbor, Mich.), p. 779-784.

BATTERIES AND FUEL CELLS AS THE POWER SOURCE

FOR TERRESTRIAL VEHICLES. R. C. Shair (Culston Industries, Inc., Metuchen, N.J.), p. 785-788.

SYSTEM DESIGN IMPLICATIONS OF ELECTRIC AND HYBRID VEHICLES. N. A. Richardson, G. H. Gelb, T. C. Wang, and J. A. Licari (TRW Systems Group, Redondo Beach, Calif.), p. 789-796.

HIGH-FREQUENCY MOTORS FOR ELECTRIC PROPULSION. R. D. Thornton (Massachusetts Institute of Technology, Cambridge, Mass.), p. 797-804.

UNDERWATER SYSTEMS.

A NAVY TWO-TO-TEN KW(E) RADIOISOTOPE POWER SYSTEM FOR UNDERSEA APPLICATIONS. M. D. Starr and G. L. Hagey (U.S. Naval Facilities Engineering Command, Washington, D.C.), p. 805-810.

DEEP OCEAN ELECTRICAL POWER SYSTEMS. A. J. Paszyc and E. Giorgi (U.S. Naval Civil Engineering Laboratory, Port Hueneme, Calif.), p. 811-820.

TRACS UNDERGROUND AND UNDERSEA RTG REVIEW. J. F. Williams (Nuclear Materials and Equipment Corp., Apollo, Pa.), p. 821-829.

A 7.5 KW(E) RADIOISOTOPE ENERGIZED UNDERSEA STIRLING ENGINE. C. E. Leach and B. C. Fryer (Battelle Memorial Institute, Columbus, Ohio), p. 830-844.

THE HYDRAZINE-OXYGEN FUEL CELL AT AMBIENT DEEP SEA PRESSURES. R. J. Bowman, H. B. Urbach, D. E. Icenhauer, D. R. Gormley, and R. E. Smith (U.S. Naval Material Command, Ship Research and Development Center, Annapolis, Md.), p. 845-851.

CHARACTERISTICS OF AN IMPROVED INERT-CATHODE/MAGNESIUM-ANODE SEA WATER BATTERY. B. J. Wilson (U.S. Navy, Office of Naval Research, Washington, D.C.), p. 852-860.

CENTRAL STATION POWER GENERATION.

A POLLUTION-FREE HYBRID FOSSIL NUCLEAR-FUELED MHD POWER CYCLE. M. Steinberg, J. R. Powell, M. Beller, and B. Manowitz (Brookhaven National Laboratory, Upton, N.Y.), p. 861-873.

DIRECT ENERGY CONVERSION STATUS FOR LARGE-SCALE POWER GENERATION. K. H. Schulze and R. K. Bhada (Babcock and Wilcox Co., Augusta, Ga.), p. 874-882.

THERMIONIC ENERGY CONVERSION FOR CENTRAL POWER STATIONS. R. E. Engdahl, A. J. Cassano (Consolidated Controls Corp., Bethel, Conn.), and R. B. Dowdell (Rhode Island, University, Kingston, R.I.), p. 883-888.

AN EVALUATION OF THE FACTORS WHICH INFLUENCE THE COST OF COAL-FIRED CLOSED-CYCLE GAS TURBINE (BRAYTON CYCLE) POWER PLANTS. S. Luchter (Mechanical Technology, Inc., Latham, N.Y.) and J. P. McGee (U.S. Department of the Interior, Washington, D.C.), p. 889-898.

ELECTROGASDYNAMIC POWER GENERATION. H. T. Gunzler, K. Martinot, and M. C. Gourdine (Gourdine Systems, Inc., Livingston, N.J.), p. 899-903.

PHYSICS OF DIRECT ENERGY CONVERSION.

A CLOSED LOOP MPD ENERGY CONVERSION EXPERIMENTAL SYSTEM. M. E. Talaat (Maryland, University, College Park, Md.), p. 904-914.

RECOMBINATION COEFFICIENTS AND TRANSPORT PROPERTIES OF AN IONIZED SUSPENSION. S. L. Soo, C. Wu, and R. C. Dimick (Illinois, University, Urbana, Ill.), p. 915-925.

COMPUTER STUDY OF ELECTROFLUIDDYNAMIC COLLOID GENERATOR. J. Minardi (Dayton, University, Dayton, Ohio), p. 926-934.

BASIC DESIGN CONSIDERATIONS FOR RADIOISOTOPE ELECTROGENERATORS. William R. Mickelsen (DANE Co., Fort Collins, Colo.), p. 935-950. 53 refs.

ADVANCED CONCEPTS.

APPLICATION OF THE SUPERCRITICAL CYCLE TO ELECTRIC POWER GENERATION IN SPACE. Ernest G. Feher (McDonnell Douglas Corp., Newport Beach, Calif.), p. 951-960.

A STUDY OF THERMAL TRANSPIRATION FOR THE DEVELOPMENT OF A NEW TYPE OF GAS PUMP. E. Hopfinger and M. Altman (Pennsylvania, University, Philadelphia, Pa.), p. 961-972.

19 refs.

THE SATURATED LIQUID ENGINE. A. M. Lord (TRW, Inc., Cleveland, Ohio), p. 973-980.

METAL HYDRIDE ENERGY STORAGE SYSTEMS. K. C. Hoffman, J. J. Reilly, R. H. Wiswall, T. V. Sheehan, and W. E. Winsche (Brookhaven National Laboratory, Upton, N.Y.), p. 981-985.

MILITARY MULTIFUEL THERMOELECTRIC GENERATORS. J. P. Angello and G. R. Frysinger (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 986-989.

DEVELOPMENT AND FLIGHT TEST OF A HYDRAZINE-FUELED TURBO-ALTERNATOR POWER SUPPLY. David J. Hucker (Sundstrand Corp., Rockford, Ill.), p. 990-995.

A THERMOELECTRIC GENERATOR POWERED BY WASTE HEAT. B. L. Embry (Utah State University, Logan, Utah) and J. R. Tudor (Missouri, University, Columbia, Mo.), p. 996-1007.

MILITARY APPLICATIONS OF STIRLING CYCLE MACHINES. G. Walker (Calgary, University, Calgary, Canada), p. 1008-1016.

PLENARY SESSION.

PLASMA MHD POWER GENERATION. R. J. Rosa (Avco Corp., Everett, Mass.), p. 1017-1023. 40 refs.

LIQUID METAL MHD POWER GENERATION. William D. Jackson (Avco Corp., Everett, Mass.), p. 1024-1032. 22 refs.

POWER NEEDS FOR ELECTRIC PROPULSION. William R. Mickelsen (Colorado State University, Fort Collins, Colo.), p. 1033-1043. 27 refs.

A68-42517

A LITHIUM/TIN CELL WITH AN IMMOBILIZED FUSED-SALT ELECTROLYTE - CELL PERFORMANCE AND THERMAL REGENERATION ANALYSIS.

H. Shimotake and E. J. Cairns (Argonne National Laboratory, Argonne, Ill.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD. VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 76-91. 45 refs. AEC-sponsored research.

Consideration of the lithium-tin system for use as a thermally regenerative cell. Current density-voltage curves for lithium-tin cells with an immobilized electrolyte are given for various operating conditions. The electrolyte immobilization is accomplished by use of a high-specific-area ceramic filler material for the formation of a rigid paste electrolyte. Because of the low lithium partial pressure under regeneration conditions, special regenerator designs are required. Integrated cell-regenerator system designs are discussed. Design calculations indicate that it should be possible to operate regenerators at rates corresponding to 10 to 40 A/cm² at pressures ranging from 1 to 2 torr, provided that care is taken in minimizing vapor-phase pressure losses. Near 1200°C, some refractory metals such as tungsten, molybdenum-tungsten alloys, and others are suitable with liquid tin. It is reasonable to expect that complete thermally regenerative systems in the size range from 1 to 10 kW will have specific power capabilities of 2 to 20 W/lb, excluding the heat-source weight.

F. R. L.

A68-42528

SNAP 29 HEAT SOURCE DESIGN AND DEVELOPMENT.

William W. Wachtl (Martin Marietta Corp., Aerospace Group, Nuclear Div., Baltimore, Md.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD. VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 194-199.

The SNAP 29 is a radioisotope thermoelectric generator RTG for space application. The SNAP 29 heat source supplies thermal

05 ENERGY CONVERSION

energy to the RTG conversion system, utilizing the radioisotope decay energy of polonium 210. The heat source is composed of a fuel block capsule assembly and the design is constrained by operational performance requirements and additional safety considerations. The design details and associated development are presented for the fuel block and capsules. Extensive development and testing have established structural requirements and capsule/fuel-block compatibility with their environments. (Author)

A68-42571 * LOW-VOLTAGE CONVERSION FROM PRIMARY AND SECONDARY SOURCES.

E. R. Pasciutti (NASA, Goddard Space Flight Center, Greenbelt, Md.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD, VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 653-661.

Single-cell batteries combined with low-input-voltage dc-to-dc conversion-regulation (LIVCR) can have advantages as a long-life energy-storage system. A simple, effective circuit technique was developed to improve push-pull-inverter crossover reliability, efficiency, and source ripple. It uses full-cycle base drive, which essentially eliminates the problems of transistor storage time. An approach using a configurational-current feedback inverter which protects against destructive saturation-current surges from the output transformer was also developed; this has important use in applications involving low-impedance sources. Sources having different output characteristics are functionally integrated into a hybrid-source application using the special LIVCRs developed, which are operationally adaptable to each source subsystem while enhancing the reliability and efficiency of the overall power-supply system. (Author)

A68-42581 PLASMA MHD POWER GENERATION.

R. J. Rosa (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD, VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 1017-1023. 40 refs.

Review of the principles of MHD power generation, possible commercial and space applications, and present status. A simple form of MHD generator consists of a duct through which the gaseous working fluid flows, coils which produce a magnetic field across the duct, and electrodes at the sides of the duct. The advantages are that it is a basically simple and rugged device capable of handling enormous power levels at temperatures that would quickly destroy any other energy-conversion device. Of great significance for the future is the potential reduction of thermal pollution, due to the potential high efficiency of MHD power plants. It is considered that eventually the MHD conversion device and the nuclear heat source will be combined. F.R.L.

A68-42582 LIQUID METAL MHD POWER GENERATION.

William D. Jackson (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD, VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 1024-1032. 22 refs.

Review of the principles of liquid-metal MHD power generation. Several possible power cycles are described, and the characteristics

of liquid-metal MHD generators are discussed. With liquid metals the magnetic Reynolds number is high enough so that direct ac generation is possible. An MHD version of the induction generator has generally been favored for the extraction of electrical energy, although some work has also been done with Faraday-type dc generators. An obvious candidate for the role of the heat source in liquid metal MHD systems is a liquid-cooled reactor of either the fast-breeder or thermo type, although a fossil-fuel-fired light-metal boiler has also been proposed. It is considered that the prospects for application of MHD power cycles operating with liquid metals to high-power space systems in the relatively near future seem promising. F.R.L.

A68-42954 THERMOELECTRIC-THERMOMAGNETIC ENERGY CONVERTER STAGING.

C. F. Kooi, R. B. Horst, and K. F. Cuff (Lockheed Aircraft Corp., Lockheed Missiles and Space Co., Research Laboratories, Palo Alto, Calif.).

Journal of Applied Physics, vol. 39, Aug. 1968, p. 4257-4263. 12 refs.

Description of an exact theory of staging of heat engines or coolers for the case where the individual stage efficiencies or performance coefficients are functions only of the fractional temperature difference $\Delta T/T$ between the hot and cold sides of the stage. In this case, for an extremum in efficiency or performance coefficient, the fractional temperature differences of each stage are equal. Exact expressions are given for the efficiency and the performance coefficient for a single stage and an infinitely staged device and for the shape of the infinitely staged device. M.C.

A68-43067 MHD INDUCTION GENERATOR.

S. J. Dudzinsky (RAND Corp., Santa Monica, Calif.) and T. C. Wang (TRW Systems Group, Space Electric Power Laboratory, Redondo Beach, Calif.).

IEEE, Proceedings, vol. 56, Sept. 1968, p. 1420-1431. 321 refs.

This paper reviews, in some detail, the general theory of MHD induction generators. Several different approaches to the analysis of constant-velocity generators are summarized and compared, and a new mathematical model for a variable-velocity generator is presented, including digital computer solutions for the theoretical performance. The velocity distribution and boundary-layer losses are considered separately, and the problem of end effect is discussed qualitatively. Recent experimental results for both separately excited and self-excited MHD induction generators are summarized, and the future of MHD induction generators is discussed briefly. (Author)

A68-43068 AN ANALYSIS OF THE OPERATION AND STABILITY OF THE CONSTANT-VELOCITY MHD HALL GENERATOR.

John H. Carey (Dynatech Corp., Fluid and Thermal Engineering Dept., Cambridge, Mass.) and William F. Hughes (Carnegie-Mellon University, Dept. of Mechanical Engineering, Pittsburgh, Pa.).

IEEE, Proceedings, vol. 56, Sept. 1968, p. 1438-1448. 6 refs.

The constant-velocity Hall-type MHD generator with segmented transverse electrodes is analyzed numerically to determine the steady-state operating characteristics and the stability with respect to axially propagating magnetoacoustic waves under a constant-current constraint. The electrical conductivity and Hall parameter are represented as functions of temperature and pressure. The variations of steady-state parameters are displayed graphically and terminal characteristics are presented. Phase velocity and amplitude data for the magnetoacoustic waves are presented in terms of steady-state parameters under a short-wavelength approximation. Three wave modes are predicted, two which damp and one which grows. For initially subsonic conditions, the two damped waves propagate downstream and the amplified one propagates upstream, which may cause choking. For initially supersonic flow the three waves all travel downstream. (Author)

A68-43071**ELECTRODE PROCESSES IN MHD GENERATORS.**

R. C. Adams (Standard Telephones and Cables, Ltd., Valve Div., Paignton, Devon., England) and Eric Robinson (English Electric Co., Ltd., Nelson Research Laboratories, Stafford, Staffs., England).

IEEE, Proceedings, vol. 56, Sept. 1968, p. 1519-1535. 28 refs.

Electrode processes strongly influence the performance and durability of an MHD generator. A theoretical analysis of these processes is made based on a model suggested by experimental work. According to these observations current transfer at the cathode usually occurs by means of small arc spots, while at the anode the discharge covers the electrode. The basic relations resulting from an energy balance within these discharges, Poisson's equation for space charge, and the electrical and thermal boundary conditions are derived in terms of the properties of the ambient gas. The calculation of these properties for MHD duct gases is then described and special attention given to the perturbation of the ionization equilibrium resulting from charge transport within the discharge. Preliminary results of computer programs designed to carry out the calculation for open and closed cycle duct conditions are presented, and it is shown that under certain conditions the discharge part of the calculation can be presented as a unique set of curves, from which the running conditions and erosion can be calculated for any electrode material. (Author)

A68-43072**AN ANALYSIS OF THE ANNULAR INDUCTION MHD GENERATOR.**

Martin J. McCutcheon (Alabama, University, Div. of Engineering, Birmingham, Ala.) and Denys O. Akhurst (Arkansas, University, Electrical Engineering Dept., Fayetteville, Ark.).

IEEE, Proceedings, vol. 56, Sept. 1968, p. 1584, 1585. 6 refs.

Contract No. DA-01-021-AMC-12820(Z).

The analysis is made for a constant-amplitude traveling magnetic field interacting with a constant-velocity fluid flowing in an annular channel. The expressions for input and output densities, electrical conversion efficiency, and generator phase impedance are given. The machine parameters and effects are included through the use of ac machinery concepts. The results are then compared with those for a generator having a rectangular channel. (Author)

A68-44312**FUEL CELLS AND FUEL BATTERIES: A GUIDE TO THEIR RESEARCH AND DEVELOPMENT.**

H. A. Liebhafsky (Texas Agricultural and Mechanical University, College Station, Tex.) and E. J. Cairns (Argonne National Laboratory, Argonne, Ill.).

Research sponsored by the U.S. Army.

New York, John Wiley and Sons, Inc., 1968. 701 p. \$27.50.

This book is a guide to the research and development of fuel cells and fuel batteries. The fundamentals underlying all fuel cells are treated in detail, stressing understanding and not technical particulars. The first half of the book builds a foundation on thermodynamics, irreversible processes, overvoltage, electrocatalysis, and transport phenomena. Special emphasis is given to the hydrogen anode and the oxygen cathode. The second half of the book is devoted to a detailed consideration of the various types of fuel cells, including those using hydrogen, compromise fuels (such as hydrazine, methanol, and reformer gases), and hydrocarbons. Molten-carbonate cells and cells with oxide-ion electrolytes are treated separately. A complete history and description of the Gemini fuel battery, the most successful of these new power sources, is given. P. G. M.

A68-44776**HANDBOOK OF FUEL CELL TECHNOLOGY.**

Edited by Carl Berger.

Englewood Cliffs, N.J., Prentice-Hall, Inc., 1968. 620 p. \$18.50.

CONTENTS:

PREFACE. C. Berger, p. vii, viii.

THE ELECTROCHEMICAL THEORY OF FUEL CELLS. L. G. Austin (North Carolina State University, Raleigh, N.C.), p. 1-218. 146 refs.

ELECTROCHEMICAL TECHNIQUES IN FUEL CELL RESEARCH. S. Srinivasan and E. Gileadi (Pennsylvania, University, Philadelphia, Pa.), p. 219-357. 151 refs.

LOW TEMPERATURE-LOW PRESSURE FUEL CELL WITH CARBON ELECTRODES. K. V. Kordesch (Union Carbide Corp., Parma, Ohio), p. 359-421. 64 refs.

THE ION EXCHANGE MEMBRANE FUEL CELL. H. J. R. Marek (General Electric Co., Lynn, Mass.), p. 423-493. 58 refs.

FUEL CELL ECONOMICS AND COMMERCIAL APPLICATIONS.

J. Verstraete, D. Lefevre, R. Lefort, and J. Henry, p. 495-596.

INDEX, p. 597-607.

A68-44779**LOW TEMPERATURE-LOW PRESSURE FUEL CELL WITH CARBON ELECTRODES.**

K. V. Kordesch (Union Carbide Corp., Development Dept., Parma, Ohio).

IN: HANDBOOK OF FUEL CELL TECHNOLOGY.

Edited by Carl Berger.

Englewood Cliffs, N.J., Prentice-Hall, Inc., 1968, p. 359-421. 64 refs.

Practical survey of the present state of carbon fuel-cell technology. Basic theory is briefly discussed in terms of the laws of physical chemistry, and theoretical examples are given to show the connection between theory and practice. Manufacturing processes are described for three types of carbon electrodes. Performance data are restricted to hydrogen-oxygen (air) fuel cells with alkaline electrolytes. The carbon electrode fuel-cell system has, in addition to its simplicity and good electrochemical characteristics, the advantage of low cost, which enables it to compete with established power sources. F. R. L.

A68-45718 *#**A REVIEW OF THE ALKALI METAL RANKINE TECHNOLOGY PROGRAM.**

S. V. Manson (NASA, Office of Advanced Research and Technology, Nuclear Power Systems Branch, Washington, D.C.).

Journal of Spacecraft and Rockets, vol. 5, Nov. 1968, p. 1249-1259. 120 refs.

Treatment of the status of the alkali metal Rankine turbogenerator program in three phases: basis technology with particular regard to critical areas; component technology; and system technology. The power plant for which technology is currently being developed consists of four loops: a Li primary loop, a K power-conversion loop, a NaK heat-rejection loop, and a NaK auxiliary cooling loop. For redundancy, four units in parallel are used in the condenser and in the latter two loops. The reactor fuel is uranium mononitride (UN), and the cladding is a ductile tungsten alloy; the structural materials for the reactor and primary loop may be W or Ta alloys. In the power-conversion loop, Ta alloys are employed in the boiler and in the ducts and structures upstream of the turbine; Mo, Ta, and Nb alloys may be employed in the turbine; Nb-base and lower temperature materials are planned for components downstream of the turbine. Stainless steel tubes and armor are the probable materials for the radiator; clad copper conducting fins and vapor chamber (heat pipe) types of fins are receiving study. F. R. L.

A69-11394 #**MHD - WHERE AT AND WHERE TO?**

Thomas R. Brogan.

Astronautics and Aeronautics, vol. 6, Nov. 1968, p. 48-53. 33 refs.

Discussion of the present state and future prospects of MHD technology. Possible MHD applications in industry are considered, and the performance and cost of the existing MHD generators are reviewed. MHD is viewed as a space-derived technology promising high profits and economic advantages but requiring large invest-

05 ENERGY CONVERSION

ment on a national scale. MHD principles, background information, and comments on work in the U.S., the USSR, the UK, France, and Japan are given. V. Z.

A69-11801 *

MATERIALS RESEARCH PROBLEMS IN THE DIRECT CONVERSION OF THERMAL RADIATIVE AND CHEMICAL ENERGY INTO ELECTRICITY.

Fritz Wald (Tyco Laboratories, Inc., Waltham, Mass.) and Martin Weinstein (Tyco Laboratories, Inc., Materials Science Dept., Waltham, Mass.).

SAMPE Journal, vol. 4, Oct.-Nov. 1968, p. 51-64. 64 refs.

Contract No. NAS 5-9149; No. N 00014-66-C-0147.

Discussion of the general mechanisms of electric energy production in the direct energy conversion methods of thermoelectricity, solar cells, thermionics, and fuel cells. Some of the materials limitations currently encountered in the use of devices based on these methods are pointed out. The advantage of a thermoelectric generator lies in its potential for long, unattended, and maintenance-free operation in severe environments. The thermionic converter uses two electrodes, separated and insulated from one another; heat is applied to one of the electrodes (typically 1400 to 2200 K), and electrons are boiled out into the intervening gap. These traverse the space between plates and are collected by the cooler anode (typically 600 to 1200 K). Part of the heat energy used to release the electrons is converted into useful voltage. The solar cell is, thermodynamically, a device which can convert radiant energy directly into electricity and therefore is not subject to the Carnot cycle limitation of a heat engine as are thermoelectric and thermionic devices. A fuel cell, as a battery, may be defined as a device which converts chemical energy directly into electrical energy. P. v. T.

A69-12425

A SHOCK TUBE STUDY OF NONEQUILIBRIUM MHD POWER GENERATION.

Yasuo Mori, Haruo Kawada (Tokyo Institute of Technology, Dept. of Mechanical Engineering, Tokyo, Japan), and Kazutake Imani. *JSME, Bulletin*, vol. 11, Aug. 1968, p. 679-690. 25 refs.

Study of an inert-gas MHD generator utilizing nonequilibrium ionization under idealized working conditions achieved in shock-tube experiments. By preheating the whole low-pressure chamber of the shock tube, it was possible to seed a sufficient amount of potassium to the working gas and to realize the conditions required for MHD power generation. The first type of generator under study utilized the induced electric field, resulting from the interaction of gas flow and magnetic field, to obtain nonequilibrium ionization. Whereas the steady-flow experiments reported so far have not yielded high electrical conductivities predicted by the nonequilibrium theory, the results of the detailed measurements in the present device were very close to those predictions. Absence of appreciable boundary effects and flow instability in experiments of such short durations are suggested to be the causes of this effect. The unfavorable effect of small amounts of impurities on the generator performance is also demonstrated. A second type of nonequilibrium generator utilizing metastable nitrogen was similarly tested, and found to be a promising alternative. Z. W.

A69-14099

TWO-DIMENSIONAL ANALYSIS OF THE MHD GENERATOR, TAKING INTO ACCOUNT THE HALL EFFECT [ZWEIDIMENSIONALE UNTERSUCHUNGEN VON MHD-GENERATOREN UNTER BERÜCKSICHTIGUNG DES HALLEFFEKTS].

Helmut Bresgen (Innsbruck, Universität, Institut für theoretische Physik, Innsbruck, Austria).

(*Österreichische Physikalische Gesellschaft, Herbsttagung, Innsbruck, Austria, 1967.*)

Acta Physica Austriaca, vol. 27, Nov. 1968, p. 248-254. In German.

Development of a new method for studying the edge effect in MHD generators. The behavior of physical quantities in an ionized gas environment is determined by combining the Maxwell equation and the corresponding extended hydrodynamic equation. For weakly

ionized gases with a low magnetic Reynolds number and a rather low electrical conductivity, the Maxwell equation can be applied without the extended hydrodynamic equation. Stated physically this means that the externally incident magnetic field is not distorted by the flow of the medium. B. H.

A69-14152

THERMODYNAMIC ANALYSIS OF A CLOSED CYCLE WITH A MHD-GENERATOR AND MHD-COMPRESSOR.

V. L. Iakimenko (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR).

(*Teplofizika Vysokikh Temperatur*, vol. 6, Mar.-Apr. 1968, p. 306-314.)

High Temperature, vol. 6, Mar.-Apr. 1968, p. 295-301. 5 refs. Translation.

Determination of the effect of Joule losses in an MHD generator and an MHD compressor on the efficiency of a closed cycle of thermal-to-electric energy conversion, in which electrical conductivity is maintained by nonequilibrium ionization. The Faraday variant of an MHD channel is discussed, assuming a one-dimensional gas flow and a small magnetic Reynolds number. The Joule losses increase with pressure and reduce sharply the efficiency of the cycle. The parameters for which the cycle has a positive efficiency are determined. V. Z.

A69-14153

ELECTROGASDYNAMIC GENERATOR.

A. T. Belevtsev, Iu. S. Bortnikov, N. S. Lidorenko, G. F. Muchnik, and I. B. Rubashov.

(*Teplofizika Vysokikh Temperatur*, vol. 6, Mar.-Apr. 1968, p. 320-326.)

High Temperature, vol. 6, Mar.-Apr. 1968, p. 306-312. 6 refs. Translation.

Theoretical and experimental investigation of the operation of a device converting the potential or kinetic energy of a moving dielectric medium into electric power. A system of direct conversion of thermal energy into electric power is examined, and some preliminary experimental data are discussed. The analytical and experimental results indicate that the "electrogasdynamic generator" should be able to compete with other existing energy converters. V. P.

A69-14154

SPECIAL CHARACTERISTICS OF INSTALLATIONS WITH MAGNETO-GASDYNAMIC CONVERTERS WORKING ON THE RANKINE CYCLE.

S. A. Mokrushin, R. V. Radchenko, V. G. Stepanov, and A. G. Sheinkman (Ural'skii Politekhnikeskii Institut, Sverdlovsk, USSR).

(*Teplofizika Vysokikh Temperatur*, vol. 6, Mar.-Apr. 1968, p. 327-332.)

High Temperature, vol. 6, Mar.-Apr. 1968, p. 313-318. 6 refs. Translation.

Comparative thermodynamic analysis of MHD generators employing the Brayton and Rankine cycles. It is shown that in the case of nonequilibrium ionization the Rankine cycle will convert at higher MHD-channel Mach numbers than the Brayton cycle. Working fluids particularly suited for use in the Rankine cycle are examined. V. P.

A69-14162

REDUCTION OF TEMPERATURE IN AN OPEN-CYCLE MGD POWER PLANT OWING TO INJECTED ADDITIVES.

I. L. Mostinskii and E. G. Smirnova (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

(*Teplofizika Vysokikh Temperatur*, vol. 6, Mar.-Apr. 1968, p. 363-365.)

High Temperature, vol. 6, Mar.-Apr. 1968, p. 355-357. Translation.

Investigation of the temperature drop in the combustion chamber of an open-cycle MHD power plant due to the addition of K_2CO_3 as a function of various parameters. The temperature drop is examined as a function of the initial temperature of the combustion products.

pressure in the combustion chamber, oxygen content in the air, the amount of additive introduced, and the technique by which the additive is introduced. Experimental data are tabulated for these dependences, using both dry K_2CO_3 and K_2CO_3 dissolved in water. No significant correlation was established between the temperature drop and the initial pressure in the chamber. T.M.

A69-16158 *#

STATUS OF PHOTOVOLTAIC POWER TECHNOLOGY.

Arvin Smith (NASA, Washington, D.C.).

American Society of Mechanical Engineers, Winter Annual Meeting and Energy Systems Exposition, New York, N.Y., Dec. 1-5, 1968, Paper 68-WA/Sol-1. 12 p. 76 refs.

Members, \$0.75; nonmembers, \$1.50.

Review of the status of photovoltaic power technology primarily from the viewpoint of current and future applications to the exploration and use of space. The photovoltaic-solar cell technology has shown steady improvement in reliability, increased efficiency, reduced cost, increased power per unit of hardware weight, and ability to withstand extremes of the space environment. New developments are underway to increase solar-cell and array size, to reduce storage volume during boosting into orbit, and to improve resistance to space radiation and thermal cycling. Silicon-cell electrical contacts and interconnections, low-energy proton damage to small exposed cell areas, and instability of CdS thin-film solar cells are examples of problems receiving attention at this time.

M.M.

A69-17905

MAGNETOHYDRODYNAMIC METHOD OF OBTAINING ELECTRICAL ENERGY [MAGNITOGIDRODINAMICHESKII METOD POLUCHENIA ELEKTROENERGII].

Edited by V. A. Kirillin and A. E. Sheindlin.

Moscow, Izdatel'stvo Energiia, 1968. 480 p. In Russian.

CONTENTS:

FOREWORD [PREDISLOVIE]. V. Kirillin and A. Sheindlin, p. 3-6.

THEORY OF NONEQUILIBRIUM LOW-TEMPERATURE PLASMA [K TEORII NERAVNOVESNOI NIZKOTEMPERATURNOI PLAZMY]; -L. M. Biberman, V. S. Vorobiev, and I. T. Iakubov (Akademiia Nauk SSSR, Moscow, USSR), p. 209-263. 48 refs.

EXPERIMENTAL INVESTIGATION OF THE TRANSPORT PROPERTIES OF A PARTIALLY IONIZED PLASMA [EKSPERIMENTAL'NOE ISSLEDOVANIE TRANSPORTNYKH SVOISTV CHASTICHNO IONIZIROVANNOI PLAZMY]. E. I. Asinovskii, V. M. Batenin, V. A. Kirillin, and E. P. Pakhomov (Akademiia Nauk SSSR, Moscow, USSR), p. 263-273. 21 refs.

EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF THE COMBUSTION-PRODUCT COMPOSITION ON THE CONDUCTIVITY IN THE PRESENCE OF A POTASSIUM ADDITIVE [EKSPERIMENTAL'NOE ISSLEDOVANIE VLIANIYA SOSTAVA PRODUKTOV SGORANIYA NA PROVODIMOST' PRI NALICHII DOBAVKI KALIIA]. S. A. Gol'denberg, E. P. Zimin, V. N. Ievlev, A. Ia. Korshunov, and V. A. Popov (Akademiia Nauk SSSR, Moscow, USSR), p. 273-280.

INVESTIGATION OF AN MHD-GENERATOR MODEL WITH AN ARGON-POTASSIUM PLASMA [ISSLEDOVANIE MODELI MGD-GENERATORA NA ARGONO-KALIEVOI PLAZME]. N. M. Maslennikov, V. N. Germaniuk, and M. A. Novgorodov (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, USSR), p. 280-291. 8 refs.

STUDY OF AN ENERGY DISCHARGE SUSTAINED BY A LORENTZ FORCE [ISSLEDOVANIE ELEKTRICHESKOGO RAZRIADA, PODDERZHIVAEМОГО СИЛОЙ ЛОРЕНЦА]. A. F. Vitshas and V. S. Golubev (Akademiia Nauk SSSR, Moscow, USSR), p. 292-303. 20 refs.

IONIZATION INSTABILITY IN A DISK CHANNEL OF A NON-EQUILIBRIUM MHD GENERATOR [IONIZATSIONNAIA NEUSTOICHIVOST' V DISKOVOM KANALE NERAVNOVESNOGO MGD-GENERATORA]. I. Ia. Shipuk (Akademiia Nauk SSSR, Moscow,

USSR), p. 308-314. 12 refs.

PARAMETERS OF MHD GENERATORS TAKING ACCOUNT OF THE IONIZATION INSTABILITY OF THE PLASMA [PARAMETRY MGD-GENERATOROV S UCHETOM IONIZATSIONNOI NEUSTOICHIVOSTI PLAZMY]. V. A. Gurashvili, Ia. A. Kar'ev, and A. V. Nedospasov (Akademiia Nauk SSSR, Moscow, USSR), p. 315-326. 12 refs.

CALCULATION OF MAGNETOHYDRODYNAMIC FLOWS IN THE CHANNELS OF MHD DEVICES [RASCHET MAGNITOGIDRODINAMICHESKIKH TECHENII V KANALAKH MGD-USTROISTV]. A. B. Vatazhin, G. A. Liubimov, and S. A. Regirer (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR), p. 329-354. 46 refs.

APPROXIMATE SOLUTION OF THE EQUATIONS FOR THE BOUNDARY LAYER ON THE WALLS OF AN MHD GENERATOR [O Priblizhennom Reshenii Uravnenii Pogranichnogo Sloia na Stenkakh MGD-GENERATORA]. L. I. Buznikova, B. G. Iotkovskii, and V. V. Kirillov (Akademiia Nauk SSSR, Moscow, USSR), p. 355-365. 7 refs.

UNSTEADY FLOW OF A CONDUCTING FLUID IN AN MHD GENERATOR CHANNEL, TAKING INTO ACCOUNT THE EXTERNAL CIRCUIT INDUCTANCE [NESTATSIONARNOE TECHENIE PROVODIASHCHEI ZHIDKOSTI V KANALE MGD-GENERATORA S UCHETOM INDUKTIVNOSTI VNESHNEI TSEPI]. A. I. Khozhainov (Akademiia Nauk SSSR, Moscow, USSR), p. 365-372. 5 refs.

OPTIMIZATION PROBLEM OF LINEAR CONDUCTION-TYPE MHD GENERATORS [PROBLEMA OPTIMIZATsii LINEIYKH KONDUKTSIONNYKH MGD-GENERATOROV]. V. I. Kovbasiuk, S. A. Medin, and A. E. Sheindlin (Akademiia Nauk SSSR, Moscow, USSR), p. 373-391. 20 refs.

VARIATIONAL PROBLEMS OF MAGNETOHYDRODYNAMICS [K VARIATSIONNYM ZADACHAM MAGNITNOI GIDRODINAMIKI]. A. N. Kraiko and F. A. Slobodkina, p. 392-417. 12 refs.

EXPERIMENTAL INVESTIGATION OF AN INJECTOR MODEL AS A VAPORIZER FOR MHD SYSTEMS [EKSPERIMENTAL'NOE ISSLEDOVANIE MODELI INZHEKTORA KAK RAZGONNOGO USTROISTVA DLIYA MGD-USTANOVOK]. M. E. Deich, E. P. Markov, A. P. Sevast'ianov, G. V. Tsiklauri, E. E. Shpil'rain, and K. A. Iakimovich (Akademiia Nauk SSSR; Moskovskii Energeticheskii Institut, Moscow, USSR), p. 433-444. 9 refs.

DETERMINATION OF THE LOCAL PARAMETERS OF A FLOW IN THE MIXING CHAMBER OF A VAPORIZER [OPREDELENIE LOKAL'NYKH PARAMETROV POTOKA V KAMERE SMESHENIIA RAZGONNOGO USTROISTVA]. E. E. Shpil'rain, G. V. Tsiklauri, A. K. Rozental', and A. P. Sevast'ianov (Akademiia Nauk SSSR, Moscow, USSR), p. 444-456.

METHOD OF DESIGNING A SIMPLE INJECTOR [METODIKA RASCHETA PROSTISHOGO INZHEKTORA]. M. E. Deich, V. F. Stepanchuk, G. V. Tsiklauri, and A. P. Sevast'ianov (Moskovskii Energeticheskii Institut; Akademiia Nauk SSSR, Moscow, USSR), p. 456-467.

ESTIMATION OF THE EFFICIENCY OF LIQUID-METAL MHD SYSTEMS WITH JUMPWISE OPERATION OF THE INJECTOR IN THE MIXING CHAMBER OF THE VAPORIZER [OTSENKA EFFEKTIVNOSTI ZHIDKOMETALLICHESKIKH MGD-USTANOVOK PRI RABOTE INZHEKTORA SO SKACHKOM V KAMERE SMESHENIIA RAZGONNOGO USTROISTVA]. V. F. Stepanchuk and G. V. Tsiklauri (Moskovskii Energeticheskii Institut, Moscow, USSR), p. 468-476.

A69-17909 *

INVESTIGATION OF AN MHD-GENERATOR MODEL WITH AN ARGON-POTASSIUM PLASMA [ISSLEDOVANIE MODELI MGD-GENERATORA NA ARGONO-KALIEVOI PLAZME].

N. M. Maslennikov, V. N. Germaniuk, and M. A. Novgorodov (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, USSR). IN: MAGNETOHYDRODYNAMIC METHOD OF OBTAINING ELECTRICAL ENERGY [MAGNITOGIDRODINAMICHESKII METOD POLUCHENIA ELEKTROENERGII].

Edited by V. A. Kirillin and A. E. Sheindlin. Moscow, Izdatel'stvo Energiia, 1968, p. 280-291. 8 refs. In Russian.

Measurement of the electrical conductivity of a potassium-

05 ENERGY CONVERSION

seeded argon plasma in an induced electric field at a static gas temperature in the range from 1300 to 1500 K and at a pressure of 0.04 atm in the flow. Experiments were conducted with two identical devices; one was used to study the effects near the electrodes, while the other served for optical observations. Current flows between the electrodes are examined, along with the cathode and anode voltage drops at the potassium-activated electrodes. Optical observations concern the effect of the plasmatron arc on the spectrum and conductivity of the plasma. T.M.

A69-18255

STUDIES OF THERMIONIC ENERGY CONVERTERS [UNTERSUCHUNGEN AN THERMIONISCHEN ENERGIEWANDLERN]. Willi Thielo (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und elektrische Antriebe, Stuttgart, West Germany).

DVL-Nachrichten, Jan. 1969, p. 409, 410. In German.

Review of research and development studies in the field of direct conversion of heat to electric power carried out in the Institut für Energiewandlung und elektrische Antriebe at Stuttgart. The theory and efficiency of thermionic energy converters are discussed. Design considerations aimed at improving the performance of these devices are mentioned. V. Z.

A69-20124

PROGRESS TOWARDS A NUCLEAR FUSION REACTOR.

J. B. Adams (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Harwell, Barks., England). Contemporary Physics, vol. 10, Jan. 1969, p. 1-20. 42 refs.

Description of the physical conditions under which nuclear fusion reactions are most likely to be sustained, with emphasis on the sharp difference between the plasma state of matter necessary for nuclear fusion reactions and the thermodynamically more relaxed conditions sufficient for nuclear fission reactions. The confinement of hot dense plasmas by magnetic fields is the principal scientific problem to be solved, and progress in this work under the main headings of open-ended magnetic confinement systems and closed magnetic confinement systems is described. The technological problems of nuclear fusion reactors, which are the next major obstacle to be overcome once the confinement problem is solved are reviewed, and the economic possibilities of these reactors as electric power producers are examined. (Author)

A69-20871

DESIGN AND DIMENSIONING OF A NUCLEAR POWER SUPPLY INSTALLATION WITH AN IN-CORE THERMIONIC REACTOR [ZUR AUSLEGUNG UND BEMESSUNG EINER NUKLEAREN ENERGIEVERSORGUNGSANLAGE MIT INCORE-THERMIONIK-REAKTOR].

A. Quast and W. Rasch (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Strahlantriebe, Institutsteil nichtkonventionelle Antriebe und Energetik, Braunschweig, West Germany). DFL-Mitteilungen, Dec. 1968, p. 381-393. 23 refs. In German.

Description of the in-core thermionic reactor (ITR) envisioned as a common project of the BBC, Interatom, and Siemens, with the expectation that a terrestrial test reactor will be constructed within the next fifteen years. The theoretical basis of the reactor is treated, and a detailed analysis of its components is given. These include the cooling system, the radiator, the capacitive cooling, and the reactor shielding. The application of the ITR as a space power source, and for use in satellites for direct TV broadcasts, is discussed. B.H.

A69-21054

DIRECT ELECTROCHEMICAL CONVERSION OF THE ENERGY OF A RADIOACTIVE ELEMENT [CONVERSION ELECTROCHIMIQUE DIRECTE DE L'ENERGIE D'UN RADIOELEMENT].

C. Eyraud, J. Lenoir, and P. Jenin (Lyon, Université, Laboratoire de Génie Chimique, Lyon; Direction des Recherches et Moyens d'Essais, Paris, France).

IN: ELECTROCHEMICAL GENERATORS FOR SPACE APPLICATIONS; CENTRE NATIONAL D'ETUDES SPATIALES, INTERNATIONAL CONVENTION, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS [LES GENERATEURS ELECTROCHIMIQUES POUR APPLICATIONS SPATIALES; CENTRE NATIONAL D'ETUDES SPATIALES, COLLOQUE INTERNATIONAL, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS].

Paris, Dunod Editeur, 1968, p. 233-243. 6 refs. In French.

Description of two fuel cells using radioactive elements and working at room temperatures. The first fuel cell has a cathode and anode made of paper or textile covered by copper and nickel, respectively. Moreover, the anode is coated by an activated palladium coating. The electrolyte is a solution of potassium hydroxide or sodium silicate. The cell is powered by a mixture of hydrogen and oxygen obtained by water radiolysis. It is found that this fuel cell has a relatively short life. The second fuel cell, which is purely hypothetical, has a palladium-coated nickel foil anode and a copper or silver foil cathode. It is suggested that the water radiolysis in this cell be carried out inside the fuel cell by means of ^{210}Po or ^{60}Co . Z.W.

A69-21592

ANALYSIS OF A POWER SOURCE EMPLOYING AN MHD GENERATOR AND A THERMOCOMPRESSOR [ANALIZ SKHEMY ENERGETICHESKOI USTANOVKI S MGD-GENERATOROM I TERMOKOMPRESSOROM].

V. I. Kovbasiuk and S. A. Medin (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). Teplofizika Vysokikh Temperatur, vol. 6, Nov.-Dec. 1968, p. 1118-1123. 5 refs. In Russian.

Thermodynamic analysis of an electric power source employing an MHD generator in combination with a device in which injection of a coolant leads to an increase in total pressure in a high-velocity hot gas flow (thermocompressor). It is shown that such a thermodynamic cycle, in addition to possessing high efficiency, also increases the stability of the power source and makes it possible to obtain a high-temperature heat exchanger with constant pressure characteristics. The optimum operational conditions of the thermocompressor are determined, and the thermodynamic cycle studied is compared with a conventional Brayton cycle. V.P.

A69-22457

ANALYSIS OF AN OPTICAL MOTOR SYSTEM ENERGIZED WITH A LASER.

Robert H. Johnson, Alfred P. Szewski, and T. Koryu Ishii (Marquette University, Dept. of Electrical Engineering, Milwaukee, Wis.).

IN: NATIONAL ELECTRONICS CONFERENCE, 24TH, CHICAGO, ILL., DECEMBER 9-11, 1968, PROCEEDINGS.

Conference sponsored by the Illinois Institute of Technology, the Institute of Electrical and Electronics Engineers, Northwestern University, and the University of Illinois. Oak Brook, Ill., National Electronics Conference, Inc., 1968, p. 377-381.

Description of an optical motor that efficiently converts laser energy into mechanical rotational energy. Theoretical and experimental analysis of an optical motor system energized by a laser shows a peaking of speed at various distances from the laser. Conditions for a long-distance self-starting motor system are given. Theoretical equations, which were experimentally verified, for controlling the speed of the motor are described. The motor system employs silicon solar cells mounted on a rotor coil with three coils in a Y connection. A permanent magnet inside the coil is fixed to the motor mount. F.R.L.

A69-23095

THE OPTIMUM DYNAMIC REGIMES OF MGD ENERGY CONVERTERS.

O. E. Pushkarev.

(Magnitnaia Gidrodinamika, no. 1, 1966, p. 55-64.)

Magnetohydrodynamics, vol. 2, Jan.-Mar. 1966, p. 30-35. 9 refs. Translation.

Application of the one-dimensional equations for the channel flow of a conducting gas to the investigation of the optimum modes of operation of an MGD converter, in the case of constant local electric efficiency and magnetic field inductance. The applicability range of the one-dimensional approximation to the electric and magnetic quantities is established. Optimality conditions are derived for which the system of MHD equations for an MGD converter can be written in closed form. Analytical solutions of several practical problems are obtained which provide qualitative estimates of converter operation. V. P.

A69-23102

AN O-SHAPED UNSATURATED MAGNETIC SYSTEM WITH TWO EXCITATION COILS DESIGNED FOR MHD-MACHINERY.
P. V. Kachanov.

(Magnitnaia Gidrodinamika, no. 1, 1966, p. 142-145.)

Magnetohydrodynamics, vol. 2, Jan.-Mar. 1966, p. 85, 86. Translation.

Magnitnaia Gidrodinamika, no. 1, 1966, p. 142-145. In Russian.
Discussion of O-shaped magnetic systems which use an unsaturated steel magnetic circuit to produce strong uniform magnetic fields. It is shown that in the case of a uniform distribution of the current sheet over the perimeter of a channel of square cross section, a strong magnetic field can be obtained provided the magnetic circuit remains unsaturated. V. P.

A69-23441 #

ELECTROPHYSICAL AND RADIATIVE PROPERTIES OF A NONEQUILIBRIUM ARGON-POTASSIUM PLASMA AS A POSSIBLE WORKING FLUID FOR AN MHD GENERATOR [ELEKTROFIZICHESKIE I RADIATSIONNYE SVOISTVA NERAVNOVESNOI ARGON-KALIEVOI PLAZMY-VOZMOZHNOGO RABOCHEGO TELA MGD-GENERATORA].

V. G. Andropov, E. I. Asinovskii, V. M. Batenin, G. S. Lopatskii, and V. F. Chinnov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 117-144. 25 refs. In Russian.

Experimental investigation of the influence of emission and of an external magnetic field on the nonequilibrium electrical conductivity of an argon-potassium plasma. To this end, the resonance radiation from an optically inhomogeneous finite plasma volume is studied, together with the influence of radiation on the establishment of partially local thermodynamic equilibrium. The experimental results obtained for the diffusion of resonance radiation and for the electron energy losses due to elastic collisions are used to identify the nature of the energy redistribution between the particles and photons as they approach the plasma boundary. It is shown that resonance radiation can contribute as much as 30% to the local energy balance. An investigation of the effective electrical conductivity of a nonequilibrium plasma in a transverse magnetic field under conditions encountered in an MHD generator shows that both acoustic and ionization instabilities can arise in such a plasma even when the value of the Hall parameter is on the order of unity. V. P.

A69-23450 #

INVESTIGATION OF ARGON DISCHARGES WITH METAL CAPILARY CATHODES.

G. Hahn and M. Salvat (Institut für Plasmaphysik GmbH, Garching, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 331-342. 7 refs.

EURATOM-supported research.

Investigation of argon discharges in order to explore the possibility of using pure rare gases as the working medium in MHD generators. In pure inert gas generators the electrons have to be produced at the channel entrance by preionization at the gas temperatures involved (about 1500 K). The current-voltage characteristic of such a discharge is largely governed by the number of electrons on the upstream side of the discharge gap, the flow velocity, electrode phenomena, and the gas temperature. A system was assembled in which the factors listed could be investigated, using argon as the gas. Investigations were conducted in static gas and in streaming gas. G. R.

A69-23454 #

METHODS OF DETERMINING INDUCED MAGNETIC FIELDS IN LINEAR DC MHD GENERATORS [METODY OPREDELENIYA INDUTSIROVANNYKH MAGNITNYKH POLEI V LINEINYKH MGD-GENERATORAKH POSTOIANNOGO TOKA].

A. I. Bertinov, D. A. But, and V. I. Chitcheian (Moskovskii Aviatsonnyi Institut, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 463-485. 10 refs. In Russian.

Description of two methods of estimating the effect of the intrinsic field of the channel of a linear dc MHD generator on the characteristics of the generator. Channels with ferromagnetic walls and nonmagnetic walls are considered. Equations are derived for determining the distortion of the electromagnetic field by a traveling conducting medium in channels with ferromagnetic walls. A Fredholm equation of the second kind with two independent variables is used for determining the two-dimensional intrinsic field in channels bounded by nonmagnetic walls. V. Z.

A69-23457 #

EXPERIMENTAL INVESTIGATION OF INSTABILITIES IN A POTASSIUM-SEEDED ARGON PLASMA IN CROSSED ELECTRIC AND MAGNETIC FIELDS.

W. Riedmüller (Institut für Plasmaphysik GmbH, Garching, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 519-528. 6 refs.

EURATOM-supported research.

Investigation of the degree of impairment instabilities may cause in the characteristics of MHD generators operating on alkali-seeded noble gases with nonequilibrium ionization. Results of detailed investigations on the onset and amplitudes of fluctuations in a streaming argon-potassium plasma in crossed electric and magnetic fields are presented. The experiments are performed at atmospheric pressure, gas temperatures up to 2000 K, and gas velocities up to 500 m/sec. An experimental device which was used to separate the losses caused by instabilities from others, such as wall effects, is described. The results of time-resolved and simultaneously performed electric field strength, electron temperature, and electron density measurements are presented. These quantities are measured as functions of the magnetic field strength, current density, electron temperature elevation, gas temperature, and gas velocity. From these measurements it is possible to derive the amplitudes and the phase relations between the various quantities, as well as the velocity and direction of the disturbances. M. M.

A69-23458 #

CESIUM-DOPED MERCURY AS A WORKING FLUID FOR STUDYING THE SPECIFIC FEATURES OF MHD GENERATORS BASED ON A

05 ENERGY CONVERSION

RANKINE CYCLE [RTUT'] S TSEZIEM KAK RABOCHEE VESHCHESTVO DLIA IZUCHENIA OSOBENNOSTEI MGD-GENERATOROV, RABOTAIUSHCHIKH NA TSIKLE RENKINA]. Ju. A. Kareev, V. T. Karpukhin, and A. V. Nedospasov (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 547-568. 8 refs. In Russian.

Results of an experimental and theoretical study of the characteristics of a mercury-cesium plasma in crossed electric and magnetic fields. The study is aimed at determining the performance of such plasmas as the working fluids of MHD generators using Rankine metal-vapor cycles. The maximum ratio between the Hall field and the longitudinal field attainable with such plasmas is found to be about two. Efficiencies ranging from 5 to 20%, depending on the parameters of the Rankine cycle, are obtained for Faraday-type MHD generators using nonequilibrium mercury-cesium plasmas. It is contended that the turbulent state of such plasmas does not preclude an effective energy conversion in such MHD generators. V. Z.

A69-23460 #
EFFECTIVE CONDUCTIVITY OF AN MHD PLASMA IN A TURBULENT STATE.

V. Zampaglione (Comitato Nazionale per l'Energia Nucleare, Laboratorio Conversione Diretta, Frascati, Italy). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 593-604.

Extension of Velikhov and Dykhne's nonlinear theory of plasma turbulence due to ionization instability (1963) to the range of values of the Hall parameter where it can be applied - namely, near the stability limit - including gas temperature effects, for the case of an MHD generator with constant load coefficients. A closed set of implicit equations is obtained for the basic averaged parameters of the plasma in the turbulent state, and these equations are then solved for values of the driving parameters corresponding to typical conditions of an MHD experiment. For large values of the Hall parameter, a theory is developed under the assumption of isotropic turbulence. Comparisons of the two theories with experimental data are discussed. M. M.

A69-23463 #
STUDY OF THE ELECTRICAL CONDUCTIVITY OF THE PLASMA IN COAXIAL-TYPE MHD GENERATOR MODELS [ISSLEDOVANIE ELEKTROPROVODNOSTI PLAZMY V MODELIKHAH MGD-GENERATOROV KOAKSIAL'NOGO TIPA]. M. I. Afanas'ev, V. V. Pirogovskii, Ju. T. Puzynovich, I. I. Sabanskii, A. M. Stolov, and A. D. Frolov (Nauchno-Issledovatel'skii Institut Elektrofizicheskoi Apparatury, Leningrad, USSR). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 1 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-a to 1-g).

Vienna, International Atomic Energy Agency, 1968, p. 643-662. 10 refs. In Russian.

Investigation of the electrical conductivity and electron temperature in a coaxial experimental MHD generator with a steady annular magnetic field, using inert gases with alkali metal additions as the working fluids. The effect of the Joule heating of the plasma electron component by induced or applied electric fields on the performance of these MHD generators is studied. The results are in satisfactory agreement with available experimental results. V. Z.

A69-23471 #
THE M. I. T. NON-EQUILIBRIUM MHD GENERATOR. J. L. Kerrebrock and M. A. Hoffman (Massachusetts Institute of Technology, Cambridge, Mass.). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 789-805. 11 refs.

Contract No. AF 33(615)-67-C-1148.

Experimental investigation of the behavior of a linear nonequilibrium MHD generator, operating at $M = 2$, at a Hall parameter of three (or more), and using cesium-seeded helium as the working fluid. The generator is large enough to minimize viscous effects and permits large nonequilibrium effects. The tests were performed with several generator configurations with hot and cold insulator walls, with and without preionization, and in both Faraday and Hall connections. It proved possible to obtain electron temperatures as high as 2700 K but only near short circuit, because the Hall voltage was never more than a fraction of its ideal value. Preionization was found to be a necessary factor. Several loss mechanisms are proposed to explain the low Hall fields observed. These include electrothermal instabilities, electrode wall shorting, insulator wall boundary layer shorting, and end losses. It was found that behavior near open circuit could be controlled using cold insulator walls and a combination of electrode wall shorting and end losses, while insulator boundary layer shorting appeared to be advantageous in the case of hot insulator walls. Means of preventing these shorts are examined. V. P.

A69-23473 #
HIGH HALL COEFFICIENT EXPERIMENTS IN A LARGE DISC GENERATOR. J. F. Louis (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 825-849. Contract No. AF 33(615)-3413.

Experimental investigation of the plasma properties and fluid mechanics of a large disk generator driven by argon or molecular gases seeded with cesium. In seeded argon, large amounts of nonequilibrium ionization were found to exist but were accompanied by large electron density fluctuations. A value of two was obtained for the maximum effective Hall coefficient, which agrees with the theoretical expectations for a plasma with pronounced isotropic fluctuations. The generator performance and the plasma properties are compared for geometrically different preionization discharges. A preionization discharge brings the degree of seed ionization close to a value of one upstream of the generator inlet and eliminates the relaxation and inlet losses; however, electron density fluctuations associated with nonequilibrium ionization still exist. V. P.

A69-23475 #
EXPERIMENTAL RESULTS OF MHD CONVERSION USING A RARE GAS [RESULTATS D'EXPERIENCES DE CONVERSION MHD A GAZ RARE]. R. Bertrand, J. C. Coche, J. P. Jacquemin, J. Le Bronec, C. Vavasseur, and P. Zettwoog (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, Essonne, France). IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 873-880. In French.

Discussion of the experiments carried out on the Typhce loop and a tentative interpretation of results. An MHD region is selected in which the one-dimensional theory without electron heating represents the zero-order approximation. A theoretical description of the actual duct is obtained by introducing a certain number of correction effects. For each of these effects the measures to be taken to eliminate the correction or to reduce it to a low order of magnitude are considered. It is shown that, from this point of view, heating of the electrons is not particularly desirable. An attempt is made to reduce the discrepancies between theory and experimental results by improving the accuracy of the measuring devices.

Z. W.

A69-23479 #

CLOSED-CYCLE MPD EXPERIMENTS WITH APPLIED ELECTRIC AND MAGNETIC FIELDS.

I. R. McNab, R. Brown (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England), and M. G. Haines (London, University, Imperial College of Science and Technology, Physics Dept., London, England).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 925-938, 17 refs.

Research supported by C. A. Parsons and Co., the International Research and Development Co., and AEC.

Description of experiments performed in a closed-cycle MPD facility with applied electric and magnetic fields. During experiments using applied magnetic fields, the performance of linear segmented electrode generators was found to be less than ideal. The Faraday open circuit voltage, plasma conductivity, and Hall voltage were lower than predicted by theory, and increasing the magnetic field strength increased the discrepancy between theory and experiment. The major factors affecting generator performance were current leakage through the insulator, finite segmentation effects, inlet ionization and recombination relaxation effects, and plasma nonuniformities. Current leakage was the major influence on the Faraday open-circuit voltage, and good agreement with theory was obtained for generators operating under different conditions. Plasma nonuniformities, arising from inadequate mixing of the cesium seed with the main helium flow and the laminar flow in the small cross-section generators, and finite segmentation effects were primarily responsible for the reduction in conductivity and Hall voltage. Inlet-relaxation calculations showed that no magnetically induced ionization should be expected, as was observed, and that the generator free-stream conductivity should be frozen near the stagnation value. The frozen conductivity was used to correlate the experimental results with theories relating to nonideal generator behavior.

M. M.

A69-23480 #

EXPERIMENTAL STUDY OF AN MHD GENERATOR MODEL WITH A NONEQUILIBRIUM PLASMA [EKSPERIMENTAL'NOE ISSLEDOVANIE MODELI MGD-GENERATORA S NERAVNOVESNOI PLAZMOI]. N. M. Maslennikov, V. N. Germaniuk, and M. A. Novgorodov (Vsesoiuznyi Elektrotekhnicheskii Institut, Moscow, USSR).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 939-955, 6 refs. In Russian.

Discussion of the performance of an experimental MHD generator operating on a nonequilibrium argon plasma with potassium additions in the presence of an induced electric field or an external electric field. Experiments with a single tantalum cathode and a single copper anode and with ten pairs of such electrodes are carried out on the generator model. The highest emissivity of a potassium-activated tantalum cathode is established at a pressure of 0.25 atm,

at cathode temperatures from 1400 to 1600 K. Spectral measurements show that the residual ionization in the plasmatron and the electron heating in the electric field of the generator are responsible for the instability of the argon plasma.

V. Z.

A69-23483 #

DESIGN AND OPERATION OF AN EXPERIMENTAL CLOSED-LOOP MAGNETOPLASMA DYNAMIC ENERGY CONVERSION SYSTEM. E. Talaat (Maryland, University, Dept. of Mechanical Engineering, College Park, Md.).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 1017-1040, 16 refs.

Description of an experimental closed-loop MPD energy conversion system recently completed at the University of Maryland. This system is capable (1) of steady-state operation, (2) of circulating 4 mole/sec of any inert gas (or any mixture of inert gases), (3) of injecting up to about 0.04 mole/sec of caesium vapor, (4) of cyclically heating the mixture up to about 1500 K and cooling it down to temperatures within about 25 K above the environmental water temperatures, and (5) of separating the caesium as liquid for reevaporation and reinjection. The system was developed for the purpose of experimentally investigating the problems of usefully operating, in the nonequilibrium or auxiliary ionization mode, an MPD energy conversion duct with inert gases seeded (or unseeded) with caesium vapor, at gas temperatures up to 1500 K.

Z. W.

A69-23484 #

AN IMPULSE INDUCTION MHD GENERATOR HAVING A MAGNETIC FIELD WITH A RADIAL COMPONENT. J. Lego (Vysoká Škola Technická, Prague, Czechoslovakia).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 1043-1059.

Theoretical and experimental investigation of an impulse induction MHD generator with a cylindrical channel. Given certain assumptions, it is possible to write the general system of partial differential equations, which describes the behavior of the generator. The mean spatial values of the physical quantities are calculated under certain simplifying conditions, and a system of ordinary differential equations is obtained. After separation, the ordinary third-order differential equations for the velocity and current are found. These equations are homogeneous with constant and identical coefficients. The solution of these equations is not too complicated, and information about their time dependence is obtained. The expressions for the power generated and generator efficiency are found in the usual way, and an equation is obtained for the voltage characteristic, while the characteristic of the generator is found not to be, in general, linear. The equations for the case of open-circuit current and short-circuit voltage are derived. They are the ordinary second-order differential equations, and their solutions give the possibility of determining two of the parameters of the plasma clusters. The theoretical conclusions are verified experimentally.

M. M.

A69-23487 #

EXPERIMENTS ON A STRIATED-FLOW INDUCTION SYNCHRONOUS MHD GENERATOR. J. Milewski, J. Stańco, and J. Samulski (Polska Akademia Nauk, Instytut Maszyn Przepływowych, Gdańsk, Poland).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30,

05 ENERGY CONVERSION

1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 1097-1105. 6 refs.

Description of a method for producing a striated-flow in an induction synchronous MHD generator by nonthermal ionization of an inert seeded gas in the internal induced electric field of the generator. An experimental device is described in which an un-ionized gas (argon with a seed) at low pressure flows in an axial direction through an annular duct in which an alternating circumferential electric field is present. A stream of constricted ring discharges flowing with the gas is obtained, the discharges being initiated at the duct inlet by a rf ignition coil. The pressure of the gas was about 40 torr, the temperature was about 600 K, and the electric field intensity was about 2 V/cm peak. As a second step, the MHD generator itself was investigated. The experimental device was modified by removing the ac source and applying a dc radial magnetic field of sinusoidal distribution along the duct. A circumferential electric field resulted from the gas motion across the applied magnetic field. M.C.

A69-23490

EXPERIMENTAL WORK ON INDUCTIVE MAGNETOPLASMA DYNAMIC CONVERTERS.

W. Peschka, W. Seeger, and H. Eitel (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und elektrische Antriebe, Stuttgart, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 1151-1160.

In the paper an experimental arrangement is described which consists of a closed-cycle system, an ionization duct and an inductive MPD converter with a traveling wave component. Mercury has been used as the working medium; later it is proposed to use favorable noble gases. Ionization is effected by means of rf excitation. Some theoretical and experimental results are given. (Author)

A69-23491

EXPERIMENTAL AND THEORETICAL STUDIES OF GASEOUS SUSPENSIONS OF THERMIONIC EMITTING PARTICLES FOR USE AS MHD WORKING FLUIDS.

B. Walldie and I. Fells (Newcastle-upon-Tyne, University, Dept. of Chemical Engineering, Newcastle-upon-Tyne, England).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 2 - CLOSED-CYCLE MHD WITH GASEOUS WORKING FLUIDS (Sections 1-h to 1-k).

Vienna, International Atomic Energy Agency, 1968, p. 1161-1172. 16 refs.

Research supported by the Science Research Council and the United Kingdom Atomic Energy Authority.

Results of experimental and theoretical studies aimed at assessing whether suspensions of thermionic emitting particles would be suitable as working fluids in large-scale MHD electrical power generators. The studies are mainly concerned with coagulation in suspensions of submicron barium oxide particles in argon, but the results are relevant to other suspensions. It is shown that the most successful technique for making suspensions of submicron barium oxide particles in argon involves the reaction of barium vapor with oxygen in an argon stream in an alumina tube reactor at about 1600 K. The suspensions were found to be polydisperse with log-normal size distributions and mass mean particle diameters generally in the range from 0.15 to 0.33 μ . The rates of coagulation in these barium oxide, argon suspensions are obtained from the rate of increase of the mass mean particle diameters when the suspensions were passed through tubes at various temperatures. It is con-

cluded that because of coagulation, suspensions of solid thermionic emitting particles can only be considered as working fluids if the particle concentrations can be reduced markedly below those required theoretically for barium oxide/argon suspensions. M.G.

A69-24469

M.H.D. RESEARCH - PRESENT AND FUTURE.

M. W. Thring (Sheffield, University, Sheffield, England) and Vincent Joseph Ibberson (London, University, Queen Mary College, London, England).

The Engineer, vol. 227, Mar. 28, 1969, p. 474-477. 17 refs.

Discussion of the status of present MHD research in England and abroad and of likely trends it will take in the future. It is pointed out that MHD has been proved practicable for power generation, although the engineering has not yet been extrapolated to long-duration plants. No insurmountable difficulties are foreseeable in this respect, as materials and operating conditions are simultaneously improved. In spite of a lack of reliable calculations and comparisons with nuclear power-generation costs, the indications are that one or more of the more sophisticated ideas discussed would increase the predicted efficiency to make further development worthwhile. M.M.

A69-25214

CALCULATION MODEL FOR HALL TYPE ELECTROMAGNETIC PLASMA ACCELERATORS [EIN RECHENMODELL FÜR ELEKTRO-MAGNETISCHE PLASMA BESCHLEUNIGER VOM HALL-TYP].

W. Oldekop (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Braunschweig, West Germany) and H. J. Junge.

Luftfahrttechnik Raumfahrttechnik, vol. 15, Feb. 1969, p. 38-43. 6 refs. In German.

Investigation of the borderline case of a Hall accelerator, in which the thrust is affected only by the Lorentz forces in an external magnetic field. Experimental results obtained for an MPD accelerator are verified with a calculation model developed for a pure Hall accelerator. Although the calculation model is highly simplified, results showed good agreement with theoretical and experimental findings. The model is considered suitable for drawing conclusions on the acceleration mechanism in MPD acceleration. B.H.

A69-25359

CURRENT DISTRIBUTION AROUND A NORMAL SHOCK IN AN MHD DUCT.

John B. Heywood (Central Electricity Generating Board, Research Laboratories, Leatherhead, Surrey, England).

Plasma Physics, vol. 11, Apr. 1969, p. 259-270. 13 refs.

The two-dimensional current and voltage distribution around a normal shock wave in an MHD duct is analyzed using a conformal transformation. Both continuous electrode, and infinitely segmented electrode boundary conditions are considered. It is shown that on the anode wall for continuous electrodes, infinite current concentrations occur at the shock; for segmented electrodes, the electric field becomes infinite at this point. The dissipation is computed for this latter case and is shown to be 1/6-th of the one-dimensional dissipation over a comparable volume. It is concluded that these current and field concentrations could cause electrode and insulator damage and that a theoretical analysis of a flow with a normal shock should make some allowance for two-dimensional effects. (Author)

A69-25397

TWO-DIMENSIONAL CURRENT DISTRIBUTIONS IN FARADAY TYPE MHD ENERGY CONVERTERS OPERATING IN THE NON-EQUILIBRIUM CONDUCTION MODE.

Lajos L. Lengyel (Institut für Plasmaphysik GmbH, Garching, West Germany).

Energy Conversion, vol. 9, Mar. 1969, p. 13-23. 28 refs.

EURATOM-supported research.

Consideration of current and potential distributions in the plane normal to an applied magnetic field. Allowance is made for non-uniform gas temperature and velocity distributions, gasdynamic convection, nonequilibrium ionization and finite-rate relaxation

processes. Quantitative data are provided concerning the magnitude of these effects on the performance characteristics of MHD energy converters. Eddy currents induced in the plane normal to the flow direction are considered under open-circuit conditions. It is shown that the effective open-circuit voltage may be higher or lower than the value based on the average flow velocity/constant conductivity approximation, depending upon the plasma parameter distributions in the insulator wall boundary layers. B.H.

A69-25399

INDUCTION PHENOMENA IN MHD CONVERTERS WITH CONSTANT AND TRAVELLING MAGNETIC FIELD.

H. Weh, G. Waltke, and P. Appun (Braunschweig, Technische Hochschule, Institut für elektrische Maschinen, Braunschweig, West Germany).

Energy Conversion, vol. 9, Mar. 1969, p. 31-38. 15 refs.

Investigation of the influence of finite length and width on the operation characteristics of dc and ac MHD converters. Various mathematical methods for calculating the eddy currents caused by the finite dimensions of the converter are demonstrated. The much-used method of conformal mapping is limited to calculations of the time-invariant current distribution of dc converters. Flux-density distributions for ac and dc converters, and current loci, power output, and efficiency for ac converters are calculated. Numerical results are presented for liquid-metal and plasma dc converters. B.H.

A69-25862

DEUTSCHE GESELLSCHAFT FÜR FLUGWISSENSCHAFTEN, LECTURES ON ASTRONAUTICS, 7TH. TECHNISCHE UNIVERSITÄT BRAUNSCHWEIG, BRAUNSCHWEIG, WEST GERMANY, OCTOBER 7-11, 1968, PROCEEDINGS. VOLUME 2 - ENERGY SOURCES [DEUTSCHE GESELLSCHAFT FÜR FLUGWISSENSCHAFTEN, LEHRGANG FÜR RAUMFAHRTTECHNIK, 7TH, TECHNISCHE UNIVERSITÄT BRAUNSCHWEIG, BRAUNSCHWEIG, WEST GERMANY, OCTOBER 7-11, 1968, PROCEEDINGS. VOLUME 2 - ENERGIEQUELLEN]. Lectures supported by the Bundesministerium für Wissenschaftliche Forschung. Bonn, Deutsche Gesellschaft für Flugwissenschaften, 1968. 291 p. In German.

CONTENTS:

POWER REQUIREMENTS AND POWER SUPPLY OF SPACECRAFT [ENERGIEBEDARF UND ENERGIEVERSORGUNG VON RAUMFAHRZEUGEN]. W. Oldekop (Braunschweig, Technische Universität; Deutsche Forschungsanstalt für Luft- und Raumfahrt, Braunschweig, West Germany), p. 01-1 to 01-22.

PHYSICAL PRINCIPLES OF SOLAR CELLS [PHYSIKALISCHE GRUNDLAGEN DER SOLARZELLEN]. G. Schneider (Braunschweig, Technische Universität, Braunschweig, West Germany), p. 21-1 to 21-28. 12 refs.

SOLAR CELLS AND THEIR USE IN SPACE FLIGHT [SOLARZELLEN UND IHRE ANWENDUNG]. E. Müller (Bölkow GmbH, Ottobrunn, West Germany), p. 22-1 to 22-60. 7 refs.

SOURCES OF ELECTROCHEMICAL ENERGY FOR SPACE FLIGHT, PARTICULARLY THE SYSTEMS Zn/AgO AND H_2O_2 [ELEKTROCHEMISCHE ENERGIEQUELLEN IN DER RAUMFAHRT BESONDERS DIE SYSTEME Zn/AgO UND H_2/O_2]. A. Winsel (Braunschweig, Technische Universität, Braunschweig; Varta AG, Kellheim, West Germany), p. 23-1 to 23-41. 18 refs.

CONTROLLED VOLTAGE CONVERTER SYSTEMS FOR ON-BOARD ELECTRIC POWER SUPPLIES IN SPACECRAFT [GEREGELTE SPANNUNGSKONVERTER-SYSTEME FÜR ELEKTRISCHE BORDNETZE VON RAUMFLUGKÖRPERN]. D. Hoge, K. Maaß, and H. H. Menke (Telefunken AG, Konstanz, West Germany), p. 24-1 to 24-46. 9 refs.

THERMOELECTRIC GENERATORS AND THEIR USE IN SPACE FLIGHT [THERMOGENERATOREN UND IHRE ANWENDUNG IN DER RAUMFAHRT]. T. Renner (Siemens AG, Erlangen, West Germany), p. 25-1 to 25-34. 19 refs.

THERMIONIC ENERGY SOURCES AND THEIR APPLICATIONS [THERMIONISCHE ENERGIEQUELLEN UND ANWENDUNGEN]. R. Langpape (Brown, Boverie et Cie., AG, Heidelberg, West Germany), p. 26-1 to 26-58. 55 refs.

A69-26364

INFLUENCE OF THERMAL AND ELECTRIC CONTACT RESISTANCES ON THE OUTPUT OF THERMOELECTRIC-CONVERSION GENERATORS [INFLUENCE DES RESISTANCES THERMIQUES ET ELECTRIQUES DE CONTACT SUR LE RENDEMENT DES GENERATEURS A CONVERSION THERMO-ELECTRIQUE].

M. Jannot and G. Mordchelles-Regnier (Société Bertin et Cie., Paris, France).

Entropie, Jan.-Feb. 1969, p. 53-58. In French.

Formulation of relations governing the conditions for the most efficient energy output in thermoelectric power generators as a function of the dimensions and connection of the thermal elements. In particular, these relations provide indications concerning the losses due to thermal and electric contact resistances at the junction of the thermal elements with the hot and cold sources. P. v. T.

A69-27479

STUDY OF TWO-PHASE MEDIA FOR USE IN MHD DEVICES [ETUDE DES MILIEUX BIPHASES EN VUE DE LEUR UTILISATION DANS DES DISPOSITIFS MHD].

R. Bidard (Compagnie Electro-Mécanique, Paris, France) and J. Sterlini (Compagnie Electro-Mécanique, Centre de Recherches, Le Bourget, France).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1387-1404. In French.

Study of the operation of a two-phase MHD generator employing emulsions of gas (argon or helium) in a liquid metal (Na or NaK). An earlier work described closed loops containing the liquid metal and located entirely within the magnetic field, loops containing an emulsifier followed by an emulsion region (where the fluid expands), a gas separator, and a region where the separated liquid is compressed before being reemulsified. In this work, it is shown that the efficiency of the loops is essentially determined by two factors, one relating to the drift of bubbles relative to the liquid, and the other to the heat exchange between liquid and gas. A method of analytical calculation is presented, which makes it possible to predict the behavior of the emulsion. P. v. T.

A69-27482

ENERGY CONVERSION WITH LIQUID-METAL WORKING FLUIDS IN THE MHD-STAUSTRALHROHR.

R. Radebold (Allgemeine Elektrizitäts-Gesellschaft, Forschungsinstitut, Berlin, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1439-1461. 9 refs.

Research supported by the Bundesministerium für Wissenschaftliche Forschung.

Study of the characteristics of a single-stage "fully Carnotized" MHD process involving nonisentropic expansion by preheating the liquid before its partial evaporation by the heat source. The individual problems posed by this much simplified process are analyzed, beginning with the shock waves in the two-phase flow. These are thought to militate against the multistage process. A relatively simple method is introduced for measuring the local

05 ENERGY CONVERSION

particle velocities in the two-phase flow, using a two-beam laser interferometer. The convergent-divergent shape of the supersonic two-phase nozzle was improved from the conversion efficiency aspect. Special attention was paid to the critical fluid velocity. The investigations were extended from water as an operating medium to alkali metals. Progress was achieved in a new method of injection condensation which largely diminishes boundary-layer friction in addition to the shock waves. A rapid startup of the condensation and thus of the conversion process was ensured. P.v.T.

A69-27484

THERMAL EFFICIENCIES OF LIQUID-METAL MHD GENERATOR CYCLES.

Z. Bayer (Československá Akademie Věd, Ústav Termomechaniky, Prague, Czechoslovakia).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1477-1499. 5 refs.

The paper deals with the question whether and to what extent it is possible to improve the thermal efficiency by suitably arranging the cycle, choosing the optimum cycle parameters and the working fluid. The expression for thermal efficiency of an entirely ideal cycle is given, and the dependence on the main cycle parameters is indicated. The approximate optimum energy distribution to the individual mixing stages is derived, from which results the total improvement caused by n-stage nozzle arrangement. From the non-idealized cycle the significance of individual partial irreversibilities is determined. Some medium is taken as a working fluid, and this is characterized by a set of parameters. Of these parameters, the specific heat of the liquid phase and the critical temperature proved to be especially significant. With an increase of former parameter and a decrease of the second, the thermal efficiency increases. On the other hand, an increase of the temperature of condensation, though unfavorable for an independent MHD cycle, gives an increase of combined cycle thermal efficiency. Calculations indicate that the influence of irreversibilities in the cycle is very pronounced so that the thermal efficiency of an independently working MHD cycle is relatively low, about 5%. In a combined arrangement, which enables economical utilization of the waste heat of the MHD cycle in a low-temperature cycle - e.g., in a steam-turbine cycle - a thermal efficiency of about 43% is attainable. (Author)

A69-27485

ANALYTICAL AND EXPERIMENTAL STUDIES OF LIQUID-METAL FARADAY GENERATORS.

M. Petrick and J. Roberts (Argonne National Laboratory, Argonne, Ill.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1501-1520. 6 refs.

Description of a computational procedure which adequately predicts the performance of liquid-metal two-phase flow generators. The studies indicate that the predicted high performance of the liquid-metal MHD power system (Petrick and Roberts, 1967) should be realizable. The relative velocity does not increase greatly across the generator; in fact, the data in many instances show that the relative velocity decreases. The end losses in the dc generator can be readily controlled either through magnetic field overhang or by the use of insulating vanes. Reductions of 80 to 90% in electric end loss have been demonstrated when compared to an abrupt termination of the magnetic field. An actual overall mechanical efficiency of 76% was achieved for the single-

phase flow generator; the maximum efficiency for the two-phase flow generator was in the range of 50 to 58%. The flow through the generator appears to be very stable, as evidenced by the lack of large pressure or voltage fluctuations. P.v.T.

A69-27488

SOME RESULTS OF AN INVESTIGATION OF A SINGLE-COMPONENT VERSION OF A LIQUID-METAL MHD ENERGY CONVERTER [NEKOTORYE REZULTATY IZUCHENIYA ODNOKOMPONENTNOI SKHEMY ZHIDKOMETALLICHESKOGO MGD-PREOBRAZOVANIYA ENERGI].

V. G. Bogomolov, S. D. Dukhovlinov, E. V. Chernykh, and E. M. Shelkov (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2). Vienna, International Atomic Energy Agency, 1968, p. 1563-1586. 5 refs. In Russian.

Experimental investigation of a liquid-metal single-component MHD conversion cycle employing a condensing ejector in front of the MHD generator. The MHD cycle is analyzed, and relations for calculating the optimal cycle parameters are derived in dimensionless parameters. It is shown that the simplicity and reliability of a single-component cycle can fully compensate for its smaller efficiency as compared to a two-component cycle. V.P.

A69-27489

THERMODYNAMIC ANALYSIS OF NEW LIQUID-METAL MHD-GENERATOR CYCLES [TERMODINAMICHESKII ANALIZ NOVYKH TSIKLOV S ZHIDKOMETALLICHESKIM MGD-GENERATOROM].

V. M. Boldyrev, A. E. Morozov, P. P. Orlov, Iu. M. Sias'kin, E. E. Shpil'rain, and K. A. Iakimovich (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1587-1611. 9 refs. In Russian.

Analysis of a multicycle MHD generator employing a single-component working fluid and of a single-cycle generator employing a two-component working fluid. The possible means of improving multicycle operation with heat regeneration are examined. The first method is based on the use of a multicycle separator device employing regenerative heaters, the second is based on the use of a multicycle injector with condensation of the vapor phase at optimal vapor and liquid flow rates, and the third makes use of a multicycle injector-separator operating with humid metal vapors. Calculations show that for potassium as the working fluid, a maximum temperature of 1200 K, and a minimum temperature of 790 K, the efficiency of the MHD generator versions proposed ranges between 12 and 14%. V.P.

A69-27491

LIQUID-METAL MHD SYSTEMS WITH LAMINAR FLOW AND ELECTRIC POWER GENERATION BY THE SYNCHRONOUS PRINCIPLE [ZHIDKOMETALLICHESKIE MGD-SISTEMY SO SLOISTYM POTOKOM I OTBOROM ELEKTRICHESKOI MOSHCH-NOSTI PO SINKHRONNOMU PRINTSIPU].

E. T. Bazeev, V. E. Pavlenko, G. M. Shchegolev (Akademiia Nauk Ukrainskoi SSSR, Institut Tekhnicheskoi Teplofiziki, Kiev, Ukrainian SSR), L. G. Bezusyi, K. I. Kim, and I. M. Postnikov (Akademiia Nauk Ukrainskoi SSR, Institut Elektrodinamiki, Kiev, Ukrainian SSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC

ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1635-1646, 6 refs. In Russian.

Discussion of an MHD generator in which the laminar liquid-metal flow is broken up into sections ("liquid pistons") which are brought into motion by the expansion of the vapor enclosed between the sections. Experiments are described which show how such a piston-like flow can be obtained. Using this principle, it is possible to obtain an acceleration process without shocks and mutual slipping of the phases, to greatly reduce the thermal contact surface between the phases, thereby increasing the thermodynamic efficiency of the cycle, to obtain a constant flow rate in the channel, and to generate electric power by means of a synchronously operating MHD generator. V. P.

A69-27492

A LIQUID-METAL MHD POWER GENERATION SCHEME USING INTERMITTENT VAPORIZATION.

J. W. Bjerklie (Mechanical Technology, Inc., Latham, N. Y.) and J. R. Powell, Jr. (Brookhaven National Laboratory, Upton, N. Y.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1647-1664, 11 refs.

A new liquid metal MHD system has been studied which achieves pulses of power by shooting liquid metal slugs through an MHD generator. The slugs are formed upstream of the generator in the power tube. At the end of the tube is a small hot-walled chamber closed off by the liquid metal slug. A spray of liquid metal is admitted for a short time to the chamber so that a vapor is rapidly formed. The vapor then propels the slug down the MHD channel. The way in which the proposed system works is described, including the method of forming slugs and holding them during vapor generation, the auxiliaries required for circulating the liquid metal, and the history of the slug as it travels. An example of MHD generator is also given. The scheme is evaluated by posing an application and verifying the performance. A 400-kWe space power system was chosen. Losses evaluated include heat loss from the vapor to the slug, friction, residual kinetic energy in the slug, pumping power, and magnetic valve power losses. Vapor generation, slug stability, and power generation by MHD were evaluated. Efficiency of the system using 2700°R peak temperature and 1500°R condensing temperature was evaluated with a 60% efficient MHD generator and found to be 14.6%. The proposed system is built up of many low-power units, proving the ability to scale down to very low power levels. Development is discussed and found to depend mostly on materials suitable for the small vapor generating zone. The rest of the system operates at low temperature. Some technology exists for all components of the system. Little new technology is required to make the system a real possibility. Several improvements for the future are suggested that require more advanced technology, but which should offer the possibility of higher efficiency and lighter weight. (Author)

A69-27494

ONE-DIMENSIONAL CALCULATIONS ON A FINITE-LENGTH MHD INDUCTION GENERATOR.

M. Heusinkveld (California, University, Lawrence Radiation Laboratory, Livermore, Calif.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1681-1716, 12 refs.

AEC-sponsored research.

Solution of the problem of the finite-length induction converter in the slit-channel approximation, in which the transverse magnetic field does not vary across the gap. The fluid channel is assumed to be infinitely wide, or infinite-conductivity side shorting bars are assumed for a channel of finite width. Slug flow and scalar electrical conductivity of the channel fluid and sinusoidal time variation are assumed. Results of numerical calculations of the problem of a uniform traveling-wave generator of finite length are presented. These results include magnetic field distribution, electrical impedance, and conversion efficiency as a function of magnetic Reynolds number, generator slip, converter length in wavelengths, and end current. The basic induction equation is deduced and solved in a manner similar to that of the one-dimensional case, giving a qualitative idea of the error incurred in the use of the one-dimensional approximation. F. R. L.

A69-27495

DEVELOPMENT OF A LIQUID FLOW MHD ALTERNATING CURRENT GENERATOR [DETERMINATION D'UN GENERATEUR ALTERNATIF MHD A VEINE LIQUIDE].

M. Kant and R. Bonnefille (Paris, Université, Laboratoires de Genie Electrique, Fontenay-aux-Roses, Hauts-de-Seine, France).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1717-1729, 9 refs. In French.

Consideration of the current induced in the equivalent rotor section and the resulting field in the pole gap of a liquid-flow MHD generator, and determination of the essential design features of an MHD generator of infinite length. By dividing the generator into five geometric zones, the general equations for the induced current and the resulting magnetic field are established, and their variations are studied as a function of the different parameters. By analyzing the distribution of the induced current in the moving liquid and the conducting lateral walls, it is possible to establish the geometric parameters of the duct and, in particular, the dimensions of the linking bars that play the part of rotor winding heads. The theoretical conclusions are compared with the experimental results obtained from a linear model for slip-field measurement with interchangeable magnetic circuit and windings on the one hand, and from a low-powered liquid sodium generator on the other. F. R. L.

A69-27499

MERCURY FLOW WITH A HYDRAULIC SHOCK IN A CHANNEL SITUATED IN A TRANSVERSE MAGNETIC FIELD [TECHENIE RTUTI S GIDRAVLICHESKIM PRYZHKOM V LOTKE V POPERECHNOM MAGNITNOM POLE].

L. A. Vulis, K. E. Dzhaugashtin, and V. T. Iaglenko (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1791-1799, In Russian.

Analysis of a mercury flow in the presence of a hydraulic shock (an analog to the compression shock in magnetogasdynamics) in an MHD channel, at small magnetic Reynolds numbers. The distribution along the channel length of the characteristic values (rate of motion, thickness of the mercury layer, electric current density, etc.) is determined over a range of the principal parameters (Froude number, magnetic interaction, load factor, divergence of the channel, etc.) from calculations performed with a digital computer in a quasi-

05 ENERGY CONVERSION

one-dimensional approximation. The influence of a hydraulic shock on the nature of the flow in a transverse magnetic field is determined, and relations describing this motion are derived. V. P.

A69-27502

HIGH-FREQUENCY VARIABLE FLUID AND VARIABLE FIELD VELOCITY MHD GENERATOR.

L. L. Prem (North American Rockwell Corp., Atomics International Div., Canoga Park, Calif.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1835-1857, Contract No. AF 33(615)-67-C-1928.

Results of analytical and experimental work on the variable fluid and variable field velocity high-frequency induction generator. The interaction between the fluid-dynamic forces and the magnetic field of the stators is analyzed by an appropriate model for a 10-KW 400-cps test generator. The two-pole pair generator is divided into 12 "phase bands," and the power generation is compared for six arbitrarily selected diverging fluid channel shapes. The available kinetic energy is determined by considering the channel frictional losses. Using the energy available for electric power generation, the outputs of the bands are calculated, and the total power output for each phase of the generator is shown as a function of various channel shapes. The detailed design of the generator is described.

F. R. L.

A69-27503 *

PERFORMANCE CAPABILITIES OF LIQUID-METAL MHD INDUCTION GENERATORS.

D. G. Elliott (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1859-1877, 6 refs.

Summary of a method for designing variable-velocity, finite-length induction generators and for estimating their performance. Numerical results are given, showing the effect on efficiency of generator geometry, operating conditions, fluid properties, and power level. Efficiencies of actual generators ranged from 63% at 300 kW to 80% at 40 MW. Efficiency was relatively insensitive to iron gap and winding resistance, and two-phase flows with void fractions as high as 70% could be employed with no loss in efficiency.

B. H.

A69-27504

THE OPTIMIZATION OF MHD INDUCTION CONVERTERS.

W. Peschka, C. Carpetis, and A. Gann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und elektrische Antriebe, Stuttgart, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1879-1889.

Comparison of a single-wavelength design with compensation and a multiwavelength design without compensation for a liquid-metal MHD induction converter. Two converters using the same working fluid are calculated on the assumptions that the power output is the same, the geometrical configuration and dimensions are the same (with the exception of length), the design is optimal within the limits of possible power density, and the end losses are negligible.

It is shown that the overall efficiency and power factor of the single-wavelength machine do not exceed the corresponding values of the uncompensated multiwavelength converter. B. H.

A69-27505

CYLINDRICALLY CONSTRUCTED MHD INDUCTION CONVERTERS. H. Weh and P. Appun (Braunschweig, Technische Hochschule, Braunschweig, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1891-1906.

Experimental and theoretical investigation of linear inductive MHD converters. It is shown that the effect of losses due to the finite length of the converter can be considerably reduced by using a cylindrical method of construction. It is further shown that since a closed rotating-field winding cannot produce additional harmonics (apart from the ever-present winding-and-slot harmonics), the asymmetrical phase quantities which occur at multiphase windings of finite length can be avoided. Suitable provision can be made for reducing field distortion produced by the entry and exit flow medium, into or out of the field range. Since the end losses are closely incident to these field distortions, greater efficiency can be obtained by cylindrical construction, especially in cases involving a low number of poles.

B. H.

A69-27506

ELEMENTS OF THE GENERAL TRANSIENT-RESPONSE THEORY OF LIQUID-METAL CONDUCTION MHD GENERATORS [ELEMENTY OBSHCHEI TEORII PEREKHODNYKH REZHIMOV RABOTY ZHIDKOMETALLICHESKIKH MGD-GENERATOROV KONDUKTSIONNOGO TIPA].

A. N. Patrashev, A. G. Riabinin, and A. I. Khozhainov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1907-1933, 16 refs. In Russian.

Development of a transient response theory for ac and dc compensated MHD generators employing a constant magnetic field. It is shown that the system of coupled MHD and Kirchhoff equations can be reduced to a differential equation for the current in the external circuit, and that the order and class of this equation depends on the driving force and external circuit design. Some characteristic cases are examined for typical values of the driving force and the presence of resistance and inductive reactance in the external circuit. The nature of the transient response is analyzed for various values of the liquid-metal flow rate and of the electric current in the external circuit.

V. P.

A69-27508

RAYLEIGH-TAYLOR INSTABILITY AND METHODS OF STABILIZING IT IN SYNCHRONOUS LIQUID-METAL MHD GENERATORS [NEUSTOICHIVOST' RELEIA-TEILORA V ZHIDKOMETALLICHESKIKH SINKHRONNYKH MGD-GENERATORAKH I SPOSOBY EE STABILIZATSII].

K. I. Kim (Akademiia Nauk Ukrainsoi SSR, Institut Elektrodinamiki, Kiev, Ukrainian SSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1965-1975, 7 refs. In Russian.

Analysis of the factors leading to the onset of Rayleigh-Taylor instabilities in synchronous MHD generators employing liquid metal as the working medium. It is shown that for a generator designed to operate in a gravitational force field these instabilities can be suppressed by placing the generator channels in a vertical position. The influence of the gravitational forces can be compensated for by special stator windings producing an accelerated or decelerated traveling field. Another means of suppressing Rayleigh-Taylor instabilities is to provide a generator rated power close to the threshold power.

V. P.

A69-27509

EXPERIMENTAL RESULTS WITH A LIQUID-METAL MHD INDUCTION CONVERTER.

M. Ulber and T. Schulz (Allgemeine Elektrizitäts-Gesellschaft, Forschungsinstitut, Berlin, West Germany).
IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 1979-2004.

Investigation of an MHD induction converter working with a liquid metal stream. The test was performed in a sodium-potassium loop. The current-voltage characteristics at no load was as expected, and permitted self-excitation with capacitors. The no-load losses were determined, and divided into the iron, channel wall, side bar, and copper losses. Measurements of the magnetic field distribution over the airgap are given. It is shown that by varying the supply voltage and the flow velocity, characteristic curves can be plotted for relating input and output powers, current, and power factors to the slip. All the necessary performance data is thus obtained. Subsequent experiments were extended to an investigation of the self-excited generator. The recorded electrical characteristics were similar to those of the self-excited asynchronous generator. The typical losses due to end-effects and the velocity profile of the fluid were found to be small, owing to the great length of the converter and the low magnetic flux density in the channel.

B. H.

A69-27511

INVESTIGATION OF A LIQUID-METAL JET MHD GENERATOR [ISSLEDOVANIIE ZHIDKOMETALLICHESKOGO STRUJNOGO MGD-GENERATORA].

K. I. Dmitriev, E. A. Zotova, I. A. Ivanov, V. S. Presniakov, and F. R. Ulinich (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 2035-2046. In Russian.

Description of the results of experimental work on a jet MHD generator with a sodium liquid-metal loop, tested in off-load operation and with various loads. The experiments were carried out with a constant magnetic field and with a magnetic field rising linearly along the generator. The limits of stable operation are determined for both magnetic field conditions.

(Author)

A69-27512

EXPERIMENTAL INVESTIGATION OF LIQUID-METAL MHD GENERATORS [EKSPERIMENTAL'NYE ISSLEDOVANIYA ZHIDKOMETALLICHESKIKH MGD-GENERATOROV].

G. A. Baranov, V. F. Vasil'ev, V. A. Glukhikh, V. G. Karasev, I. R. Kirillov, and I. V. Lavrent'ev (Nauchno-Issledovatel'skii Institut Elektrofizicheskoi Apparatury, Leningrad, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 2047-2064. In Russian.

Discussion of the results of tests performed with induction, helical, and straight-through MHD generators under independent and self-excitation conditions. The working fluid was an Na-K (78% K) alloy, the alloy temperature ranged between 100 and 150°C, the maximum flow rate was 50 m³/hr, the maximum pressure was 10 kg/cm², the maximum velocity in the generator channels was 40 m/sec, and the maximum magnetic field strength was 1.43 tesla. A plane multipole self-excited induction generator was found to have a maximum output power of 1160 W, a total efficiency of 16.2%, a cos ϕ of 0.2, and an efficiency without allowance for the hydraulic channel losses of 25.9%. The maximum parameters of a nonself-excited dc generator were an output power of 2 kW and a total efficiency without allowance for channel losses of 40%, and a current of 6 kA. The maximum parameters in the case of self-excitation were 0.4 kW, 30%, and 2 kA, respectively.

V. P.

A69-27513

INVESTIGATION OF A LIQUID-METAL INDUCTION MHD GENERATOR [ISSLEDOVANIIE ZHIDKOMETALLICHESKOGO MGD-GENERATORA INDUKTSIONNOGO TIPA].

Iu. A. Bakanov, L. M. Dronnik, V. E. Strizhak, I. M. Tolmach, and E. I. Iantovskii (Akademiia Nauk SSSR, Energeticheskii Institut, Moscow, USSR).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 3 - CLOSED-CYCLE MHD WITH LIQUID-METAL WORKING FLUIDS (Section 2).

Vienna, International Atomic Energy Agency, 1968, p. 2065-2083. 7 refs. In Russian.

Experimental verification of the theory of a three-phase high-temperature liquid-metal rotating-field MHD generator. The tests were performed with a generator having a thin-walled helical channel and using potassium as the working fluid. The generator was run for 132 hr at temperatures between 300 and 475°C and 20 hr at 500 to 550°C. The pressure drop did not exceed 18 atm at an input pressure of 25 atm abs. The generator efficiency was found to equal 18%, with a maximum useful power of 500 W. The losses due to viscous dissipation, and the losses in copper, steel, the channel walls, and liquid metal are analyzed, revealing the factor responsible for the lower experimental output power as compared to the theory. The principal factor is the increase in liquid metal losses associated with the nonuniformity of the velocity profile.

V. P.

A69-28314

REDUCED INDICES OF HEAT REMOVAL INTENSITY AND INITIAL TEMPERATURES IN THERMOELECTRIC DEVICES [PRIVEDENNYE POKAZATELI INTENSIVNOSTI OTVODA TEPLA I NACHAL'NYKH TEMPERATUR V TERMOELEKTRICHESKIKH USTROISTVAKH].

N. O. Skuratovskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

Geliotekhnika, no. 6, 1968, p. 66-71. In Russian.

Description of a procedure for determining the heat conversion coefficients and the initial temperature of active elements of electric devices powered by solar energy, such as solar energy converters and thermoelectric pumps. Basic in this procedure is the incorporation of experimental values of the constant physical parameters of a given type of device into the energy balance equation for its solar cells.

V. Z.

A69-28887

COMPARISON OF THE CHARACTERISTICS OF AN IDEAL MHD INDUCTION CONVERTER DURING ITS PUMPING AND GENERATING MODES OF OPERATION, TAKING INTO ACCOUNT THE CURRENT CONDUCTIVITY OF THE CHANNEL WALLS [SRAVNENIE KHARAKTERISTIK IDEAL'NOGO INDUKTSIONNOGO MGD-PREOBRAZOVATELIA V NASOSNOM I GENERATORNOM REZHIMAKH S UCHE-TOM TOKOPROVODIASHCHIKH STENOK KANALA].

M. Iu. Abritskaya and R. R. Krishberg (Akademiia Nauk Latvinskoi SSR, Institut Fiziki, Riga, Latvian SSR).

05 ENERGY CONVERSION

Akademii Nauk Latvinskoi SSR, Izvestiia, Seriya Fizicheskikh i Tekhnicheskikh Nauk, no. 1, 1969, p. 64-72. In Russian.

Study of an ideal three-phase reactive MHD converter, with the purpose of comparing its pressure cycle with its generator cycle. Equations are derived for calculating the maximum output and the pressure developed. The analysis presented makes it possible to evaluate the effects of the current-conducting walls of the channel in three-phase MHD generators in case an exact calculation meets with difficulties. P. v. T.

A69-29172

INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency. Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969. 1438 p. In English and French. \$20.

CONTENTS:

FOREWORD. H. Neu (EURATOM and Comitato Nazionale per l'Energia Nucleare, Ispra, Italy), p. 5.

WELCOMING ADDRESS. L. Boxer (European Nuclear Energy Agency, Paris, France), p. 21, 22.

WELCOMING ADDRESS. H. Kramers (EURATOM and Comitato Nazionale per l'Energia Nucleare, Ispra, Italy), p. 22-24.

INTRODUCTION. H. Neu (EURATOM and Comitato Nazionale per l'Energia Nucleare, Ispra, Italy), p. 24-27.

CONVERTER PERFORMANCE.

SUMMARY OF APPLIED RESEARCH PROGRAM IN THERMIONIC CONVERSION DURING RECENT YEARS. F. Rufe, D. Lieb, and L. van Someren (Thermo Electron Corp., Waltham, Mass.), p. 29-43. 8 refs.

CHARACTERISTICS OF A THERMIONIC CONVERTER WITH A CHLORIDE-VAPOR-DEPOSITED TUNGSTEN EMITTER AND A NICKEL COLLECTOR. V. C. Wilson (General Electric Co., Schenectady, N.Y.), p. 45-50.

TESTS OF A NUCLEAR-TYPE CONVERTER EQUIPPED WITH A CESIUM ADSORPTION TANK [ESSAIS D'UN CONVERTISSEUR DU TYPE NUCLEAIRE MUNI D'UN RESERVOIR DE CESIUM A ADSORPTION]. P. Defranco (Compagnie Française Thomson Houston-Hotchkiss Brandt, Bagneux, Hauts-de-Seine, France), p. 51-56.

INVESTIGATION OF REFRACTORY PYROLYTIC FILMS BY MEANS OF A SECONDARY SCANNING ELECTRON MICROSCOPE [EXAMEN DES COUCHES REFRACTAIRES PYROLYTIQUES AU MOYEN DU MICROSCOPE ELECTRONIQUE SECONDAIRE A BALAYAGE]. G. Blet and O. Cahen (Compagnie Française Thomson Houston-Hotchkiss Brandt, Bagneux, Hauts-de-Seine, France), p. 57-60.

THERMIONIC CONVERTER TECHNOLOGY. P. Rouklove (California Institute of Technology, Pasadena, Calif.), p. 61-73. 18 refs.

HIGH PRESSURE CESIUM THERMIONIC CONVERTER WITH A COLD REGION. B. Stefanov and L. Zarcova (B'lgarska Akademiia na Naukite, Sofia, Bulgaria), p. 75-80. 5 refs.

FLAME-HEATED THERMIONIC CONVERTER [CONVERTISSEUR THERMOIONIQUE CHAUFFE PAR FLAMME]. M. Latouche-Halle (Compagnie Française Thomson Houston-Hotchkiss Brandt, Bagneux, Hauts-de-Seine, France), p. 81-85.

ARC-MODE THERMIONIC CONVERTER PERFORMANCE - MEASUREMENTS AND INTERPRETATION. A. E. Campbell, Jr. and A. O. Jensen (Electro-Optical Systems, Inc., Pasadena, Calif.), p. 87-102.

TECHNOLOGY OF PLANE AND CYLINDRICAL THERMIONIC CONVERTERS [TECHNOLOGIE DES CONVERTISSEURS THERMOIONIQUES PLANS ET CYLINDRIQUES]. A. M. Shroff (Compagnie Générale de Télégraphie Sans Fil, Orsay, Essonne, France), p. 103-111. 8 refs.

EVALUATION OF LABORATORY STUDIES OF LIFE DURATION OF THERMIONIC CONVERTERS [BILAN DES ETUDES DE DUREE DE VIE DES CONVERTISSEURS THERMO-IONIQUES EN LABORATOIRE]. J. Biaux, M. Clemot, J. P. Durand, and B. Gayte

(Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 113-119, 121-124. 5 refs.

INVESTIGATION OF A Ne-Ar THERMIONIC GENERATOR. M. Bacal, M. Cristescu, and C. Voci (Academia Română, Bucharest, Rumania), p. 125-132. 6 refs.

ALL-METAL NUCLEAR THERMIONIC MODULE [MODULE THERMOIONIQUE NUCLEAIRE TOUT-METAL]. B. Devin, J. P. Durand, and P. Ragot (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 133-139, 141, 142.

INTEGRATED SYSTEMS.

THE INCORE THERMIONIC REACTOR AS A SPACE POWER SOURCE. H. Andrae, D. Budnick, F. Gross, W. Jahns, K. Janner, and A. Jester (Brown, Boveri et Cie, AG, Mannheim; Internationale Atomreaktorbau GmbH, Bensberg; Siemens AG, Erlangen, West Germany), p. 143-155.

RESULTS OF STUDIES ON VARIOUS FAST AND THERMAL THERMIONIC REACTOR SYSTEMS. R. Pruschek, S. Dagbjartsson, D. Emendörfer, M. Groll, W. Haug, B. Röhrborn, H. Unger, and E. Wolf (Stuttgart, Technische Universität, Stuttgart, West Germany), p. 157-170. 25 refs.

MULTIMEGAWATT THERMIONIC REACTOR SYSTEMS FOR SPACE APPLICATIONS. C. D. Sawyer, P. R. Hill, and D. R. Wilkins (General Electric Co., Pleasanton, Calif.), p. 171-184. 5 refs.

THERMIONIC ELECTRIC PROPULSION SYSTEM CHARACTERISTICS AND CAPABILITIES. W. A. Ranken and E. W. Salmi (California, University, Los Alamos, N. Mex.), p. 185-200. 10 refs.

THERMIONIC REACTORS FOR ELECTRIC PROPULSION - PARAMETRIC STUDIES. W. G. Homeyer, C. A. Heath, and A. J. Gietzen (Gulf General Atomic, Inc., San Diego, Calif.), p. 201-220.

EXTERNAL-FUEL THERMIONIC REACTORS. M. J. Abbate, C. L. Eisen, B. Raab, and A. Schock (Fairchild Hiller Corp., Farmingdale, N.Y.), p. 221-231, 233-236.

UNINSULATED IN-CORE THERMIONIC DIODE CONCEPT. J. P. Davis and H. G. Gronroos (California Institute of Technology, Pasadena, Calif.), p. 237-242.

A HEAT PIPE THERMIONIC REACTOR CONCEPT. P. Fiebelmann, H. Neu, and C. Rinaldini (EURATOM and Comitato Nazionale per l'Energia Nucleare, Ispra, Italy), p. 243-259, 261, 262. 25 refs.

OUT-OF-CORE THERMIONIC SPACE POWER. W. E. Loewe (California, University, Livermore, Calif.), p. 263-272. 22 refs.

STABILITY AND CONTROL CONSIDERATIONS FOR THERMIONIC REACTORS. H. G. Gronroos and J. P. Davis (California Institute of Technology, Pasadena, Calif.), p. 273-279. 5 refs.

DEVELOPMENT OF A 100 WATT(e) ISOTOPE THERMIONIC ELECTRICAL POWER MODULE. E. W. Williams (General Electric Co., Valley Forge, Pa.) and R. C. Howard (Thermo Electron Corp., Waltham, Mass.), p. 281-296.

SNAP-13 GENERATOR DEVELOPMENT PROGRAM. J. B. Dunlay and R. C. Howard (Thermo Electron Corp., Waltham, Mass.), p. 297-304.

DESIGN AND CHARACTERISTICS OF AN ACTINIUM FUELED THERMIONIC GENERATOR. A. De Troyer, E. Nève de Mévergnies (Union Minière, Brussels, Belgium), M. J. Brabers, P. Dejonghe (Centre d'Etude de l'Energie Nucléaire, Mol-Donk, Belgium), G. Gammel, F. Gross, M. F. Koskinen, and R. Langpape (Brown, Boveri et Cie, AG, Heidelberg, West Germany), p. 305-336. 9 refs.

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IN-PILE EXPERIMENTS OF "SIRENE" THERMIONIC CONVERSION, AND EXAMINATION AFTER IRRADIATION OF THE "SIRENE 302" CONVERTER [EXPERIENCES DE CONVERSION THERMO-IONIQUE "SIRENE" EN PILE ET EXAMEN APRES IRRADIATION DU CONVERTISSEUR "SIRENE 302"]. J. Blixaux, M. Clemot, B. Devin, and P. Dumas (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 421-435. 7 refs.

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MATERIALS.

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FUEL AND FISSION PRODUCT TRANSPORT THROUGH CHEMICALLY VAPOR-DEPOSITED FLUORIDE TUNGSTEN.

L. Yang and R. G. Hudson (Gulf General Atomic, Inc., San Diego, Calif.), p. 575-588.

DEPOSITIONS OF TUNGSTEN, RHENIUM, NIOBIUM, AND TUNGSTEN-NIOBIUM ALLOYS BY THERMAL DECOMPOSITION IN THE VAPOR PHASE [DEPOTS PAR DECOMPOSITION THERMIQUE EN PHASE VAPEUR DE TUNGSTENE, RHENIUM ET NIOBIUM ET D'ALLIAGE NIOBIUM TUNGSTENE]. A. M. Shroff (Compagnie Générale de Télégraphie Sans Fil, Orsay, Essonne, France), p. 589-601. 6 refs.

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CESIUM SORPTION IN MATERIALS FOR THERMIONIC CON-

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GAS ADSORPTION ON TUNGSTEN SINGLE CRYSTALS [ADSORPTION DE GAZ SUR DES MONOCRISTAUX DE TUNGSTENE]. F. P. Dumont and J. Mauries (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 1347-1355. 15 refs.

THE INFLUENCE OF OXYGEN ON THE WORK FUNCTION OF TUNGSTEN. P. Batzies (Brown, Boveri et Cie. AG, Mannheim, West Germany), p. 1357-1365. 10 refs.

WORK FUNCTIONS OF POLYCRYSTALLINE W AND RE IN AN ATMOSPHERE OF CESIUM AND OXYGEN. R. Langpape and A. Minor (Brown, Boveri et Cie. AG, Heidelberg, West Germany), p. 1367-1380. 9 refs.

A CRITICAL EXPERIMENT ON THE NATURE OF ADSORBED CESIUM FILMS. E. Muz (Stuttgart, Technische Universität, Stuttgart, West Germany), p. 1381-1388. 5 refs.

STUDY OF REFRACTORY SURFACES IN THE PRESENCE OF CESIUM VAPORS BY MEANS OF AN EMISSION MICROSCOPE [ETUDE AU MICROSCOPE A EMISSION DE SURFACES REFRACTAIRES EN PRESENCE DE VAPEUR DE CESIUM]. J. L. Desplat and P. Defranould (Compagnie Française Thomson Houston-Hotchkiss Brandt, Bagneux, Hauts-de-Seine, France), p. 1389-1397. 7 refs.

SURVEY OF EXPERIMENTAL WORK IN THE USSR. Iu. L. Danilov, p. 1399-1406.

PANEL DISCUSSION - PRESENT AND FUTURE OF THERMIONIC ENERGY CONVERSION.

THE UNITED STATES' THERMIONIC PROGRAM. G. F. Tape (U.S. Atomic Energy Commission, Washington, D.C.), p. 1407-1416.

APPLICATION OF THERMIONIC ENERGY CONVERSION IN THE USSR. Iu. L. Danilov, p. 1417-1435.

A69-29190

DEVELOPMENT OF A 100 WATT(e) ISOTOPE THERMIONIC ELECTRICAL POWER MODULE.

E. W. Williams (General Electric Co., Missile and Space Div., Valley Forge, Pa.) and R. C. Howard (Thermo Electron Corp., Waltham, Mass.).

IN: INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency, Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969, p. 281-292; Discussion, p. 293-296.

Description of the development of a primary isotope thermionic electric power module in connection with the Isotope Thermionic Module Development Program of the U.S. Atomic Energy Commission. The modules considered consist of the following major assemblies: (1) heat source; (2) thermionic diode; (3) thermal insulation; (4) electric leads and lead-throughs; and (5) module housing and helium filters. Each of these assemblies is described. Tables are given for design environments, curium module performance parameters; and polonium module performance parameters.

P. v. T.

A69-29191

SNAP-13 GENERATOR DEVELOPMENT PROGRAM.

J. B. Dunlay and R. C. Howard (Thermo Electron Corp., Waltham, Mass.).

05 ENERGY CONVERSION

IN: INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency. Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969, p. 297-304.

Description of the generator design in connection with the SNAP-13 program of the U.S. Atomic Energy Commission to develop the technology required for the construction of isotope-heated thermionic converters. More than twenty generators were fabricated and tested with electrical heaters simulating the isotope heat source. All the generators were performance tested, some were life-tested, and three were environmentally tested. By the conclusion of the program, a generator had successfully survived shock and vibration testing, and the life and performance goals had been substantially exceeded. The major results achieved during the electrically heated tests are summarized. The efficiencies, power outputs, and lifetimes are presented. The design iterations leading to the successful environment tests are described. P. v. T.

A69-29278

THE UNITED STATES' THERMIONIC PROGRAM.

Gerald F. Tape (U.S. Atomic Energy Commission, Washington, D. C.).

IN: INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency. Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969, p. 1407-1416.

Outline of U.S. studies of various systems of energy sources and the coupling of these systems with nuclear energy sources. Three reactor concepts which have received primary consideration are discussed. These are the zirconium hydride reactor, the thermionic reactor, and the advanced liquid-metal-cooled reactor. Primary applications for the thermionic systems are advanced manned stations, communication satellites, and lunar bases. An eventual fast reactor application of several hundred kilowatts is hoped for. The development schedule, the reactor experiment itself, and a flight system development are examined. F. R. L.

A69-29279

APPLICATION OF THERMIONIC ENERGY CONVERSION IN THE USSR.

Iu. L. Danilov.

IN: INTERNATIONAL CONFERENCE ON THERMIONIC ELECTRICAL POWER GENERATION, 2ND, STRESA, ITALY, MAY 27-31, 1968, PROCEEDINGS.

Conference sponsored by the European Nuclear Energy Agency. Luxembourg, EURATOM Center for Information and Documentation (EUR No. 4210 f, e), 1969, p. 1417-1420; Discussion, p. 1421-1435.

Survey of research concerning thermionic energy conversion in the USSR, and discussion of possible applications in various fields. The advantages of the thermionic converter systems are outlined. The lack of mechanically moving and rotating elements and the resulting reliability may lead to increased use of thermionic converters in spacecraft. P. v. T.

A69-29911

DESIGN OF AN MHD GENERATOR WITH AN ELECTRIC CONDUCTIVITY WAVEFORM AT SMALL MAGNETIC REYNOLDS NUMBERS [RASCHET MGD-GENERATORA S VOLNOI ELEKTROPROVODNOSTI PRI MALOM MAGNITNOM CHISLE REYNOL'DSA].

L. A. Zakliaz'minskii and S. S. Katsnel'son.

Magnitnaia Gidrodinamika, vol. 5, Jan.-Mar. 1969, p. 77-85. In Russian.

Analysis of the axisymmetric unsteady interaction of a gas with a constant magnetic field and with the field of an electric circuit at small Re_m numbers. The gas flow at $Re_m \rightarrow 0$ is taken in the form of an entropy wave (i.e., when the gas pressure and velocity are constant, whereas the temperature and electrical conductivity are

arbitrary functions of the gas particle coordinates). The power emanated at the ohmic resistance of the circuit and the electric efficiency of the interaction are determined as functions of the circuit parameters and the conductivity waveform. V. P.

A69-31914

A SUPERCRITICAL THERMODYNAMIC POWER CYCLE WITH MHD GENERATOR.

J. Braun (AB Atomenergi, Nyköping, Sweden) and A. S. Roberts, Jr. (Old Dominion College, Norfolk, Va.).

AIAA Journal, vol. 7, Apr. 1969, p. 771-773. 6 refs.

Theoretical investigation of the thermodynamic parameters of a magnetohydrodynamic cycle employing supercritical mercury. The results indicate that (1) induced magnetic fields are small relative to the applied field, (2) the flow is turbulent and the hydrodynamic boundary layer is thin, (3) viscous effects are small, (4) the magnetic body force is of the same order of magnitude as the inertial force, and (5) the gravitational body force may be important for this generator. It is concluded that studies of the magnetohydrodynamic supercritical cycle must concentrate on a search for more suitable fluids, considering even mixtures. The advantages of the supercritical cycle as mentioned by Feher (1968), with the additional asset of the magnetohydrodynamic concept which eliminates moving parts, are cited as providing strong incentives for further work. P. G.

A69-32417

MEDIUM TEMPERATURE FUEL CELLS [PILES A COMBUSTIBLES A MOYENNE TEMPERATURE].

J. Laroche and G. Billaud (EMC - Office National Industriel de l'Azote, Laboratoire de Physico-Chimie, Toulouse, France).

IN: ELECTROCHEMICAL GENERATORS FOR SPACE APPLICATIONS; CENTRE NATIONAL D'ETUDES SPATIALES, INTERNATIONAL CONFERENCE, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS [LES GENERATEURS ELECTROCHIMIQUES POUR APPLICATIONS SPATIALES; CENTRE NATIONAL D'ETUDES SPATIALES, COLLOQUE INTERNATIONAL, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS].

Paris, Dunod Editeur, 1968, p. 135-142. In French.

Research supported by the Direction des Recherches et Moyens d'Essais and the Délégation Générale à la Recherche Scientifique et Technique.

Consideration of the advantages of fuel cells which operate at about 200°C. There is an improvement in the kinetics of the electrochemical reactions, and the use of precious metals is not required. The extraction of the water formed by the electrochemical combustion is accomplished by simple evaporation. It is also easy to evacuate the heat produced in the interior of the cell. F. R. L.

A69-32424

DIFFUSION OF PROTONS IN SOLIDS - APPLICATIONS TO FUEL CELLS [DIFFUSION DES PROTONS DANS LES SOLIDES - APPLICATIONS AUX PILES A COMBUSTIBLE].

M. Christen (Compagnie Générale d'Electricité de Paris, Centre de Recherches, Département Recherches Physiques de Base, Marcoussis, Essonne, France).

IN: ELECTROCHEMICAL GENERATORS FOR SPACE APPLICATIONS; CENTRE NATIONAL D'ETUDES SPATIALES, INTERNATIONAL CONFERENCE, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS [LES GENERATEURS ELECTROCHIMIQUES POUR APPLICATIONS SPATIALES; CENTRE NATIONAL D'ETUDES SPATIALES, COLLOQUE INTERNATIONAL, PARIS, FRANCE, DECEMBER 4-7, 1967, PROCEEDINGS].

Paris, Dunod Editeur, 1968, p. 217-232. 15 refs. In French.

Study of solid membranes with ion conductivity, which are of great interest in the field of fuel cells, because they make possible an easy separation of reagents (form stability), and do not require regeneration (composition stability). It is shown that the perfection of a proton electrolyte would provide new opportunities in the field of energy conversion at medium temperature. F. R. L.

A69-34700

DEVICE FOR INVESTIGATING THERMIONIC ENERGY CONVERTERS.

V. I. Petrov and A. P. Kobarenkov.

(*Teplofizika Vysokikh Temperatur*, vol. 6, Sept.-Oct. 1968, p. 947-949.)

High Temperature, vol. 6, Sept.-Oct. 1968, p. 911-913. Translation.

Description of the design of a laboratory device for investigating thermionic converters of thermal energy to electrical power. The current-voltage characteristics of the thermionic energy converter may be measured by static and dynamic methods. Measured dynamic current-voltage characteristics of a thermionic energy converter are presented for a tungsten cathode. Z.W.

A69-39027

DIRECT CURRENT MHD GENERATORS WITH VARIABLE CONDUCTIVITY, VELOCITY, AND MAGNETIC FIELD.

John J. Roberts, W. Roy Wessel, and Michael Petrick (Argonne National Laboratory, Argonne, Ill.).

Journal of Spacecraft and Rockets, vol. 6, June 1969, p. 729-734. 16 refs.

Discussion of limitations on analytical solutions of the general problem of Faraday dc generators with variable conductivity, velocity, and magnetic field. A two-dimensional numerical solution of this problem is described, and the results are presented in the form of efficiency curves for different types of field extension, and in the form of computer generated pictures of equipotential lines and current lines. Numerical results are compared with known analytical solutions and with some experiments on two-phase flow generators. For rectangular parallelpiped generators, the axial variation in the individual induced voltage due to increasing void fraction is shown to be significantly detrimental to generator performance; contouring on the channel depth to maintain a constant fluid velocity, however, can alleviate this problem. Z.W.

A69-39165

ON THE FUNDAMENTAL PHENOMENON OF MAGNETO-HYDRODYNAMIC ENERGY CONVERSION.

E. Csörsz (Mátia Regional Metal Works, Sirok, Hungary).

Acta Technica, vol. 65, no. 1-2, 1969, p. 43-55.

Discussion of the fundamental principles of the dc MHD generator using a gas plasma as a working fluid. The interaction between the components of the working fluid in the process of energy conversion is interpreted, and conditions for the validity of analysis are given. The analysis is based on the relationships of plasma equilibrium. The density of the gasdynamic forces acting on various plasma components is presented in a novel way by the product of partial pressure gradients and momentum transfer probabilities. As a result, some basic relationships for the power design of generators are derived. G.R.

A69-39478

SUPERCONDUCTING MAGNETS FOR MHD GENERATORS.

Z. J. J. Stekly (Avco Corp., Avco-Everett Research Laboratory, Everett, Mass.).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 6—INVITED LECTURE, RAPORTEURS' STATEMENTS AND DISCUSSIONS, ROUND TABLE DISCUSSIONS, INDEXES.

Vienna, International Atomic Energy Agency, 1968, p. 3467-3489. 17 refs.

Review of the main problems concerning the design, construction, and operation of superconducting magnets for MHD generators. The magnetic field concentration and the structural requirements for a saddle-shaped coil geometry are discussed. The characteristics of currently available superconductors are reviewed and compared with normally conducting room temperature and cryogenic conductors. The methods of stabilizing a superconducting winding against the

initiation of an uncontrolled propagation of a normal region, and the associated protection against the excessive voltages and temperatures are reviewed. The heat sources are outlined, and their relative importance is discussed. Several large superconducting magnet systems (not only MHD) are compared to show the state of the art of superconducting magnet technology in the U.S. Z.W.

A69-39480

FIELDS AND FLOW IN MHD CHANNELS.

L. L. Lengyel (Institut für Plasmaphysik GmbH, Garching, West Germany).

IN: ELECTRICITY FROM MHD; INTERNATIONAL ATOMIC ENERGY AGENCY, SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER GENERATION, WARSAW, POLAND, JULY 24-30, 1968, PROCEEDINGS. VOLUME 6—INVITED LECTURE, RAPORTEURS' STATEMENTS AND DISCUSSIONS, ROUND TABLE DISCUSSIONS, INDEXES.

Vienna, International Atomic Energy Agency, 1968, p. 3539-3550; Discussion, p. 3550-3553. 20 refs.

Discussion of the distributions of the electric field and current in MHD energy converters, and analysis of certain MHD flow problems. A review is given of recent research concerning (1) the output characteristics of MHD generators, (2) optimization of MHD ducts, (3) use of equivalent electrical circuits, (4) measurements of current-voltage characteristics in simulated MHD generators, and (5) stability considerations applied to MHD boundary layers. MHD Couette flow and flows at abruptly changing duct cross sections are also considered. Z.W.

A69-40131

THE INFLUENCE OF VARIABLE THERMAL CONDUCTIVITY AND VARIABLE ELECTRICAL RESISTIVITY ON THERMOELECTRIC GENERATOR PERFORMANCE.

Jerry S. Lee (North Carolina State University, Raleigh, N.C.).

Energy Conversion, vol. 9, Aug. 1969, p. 91-97. 12 refs.

Derivation of closed-form analytical solutions for the steady-state temperature distribution, power output, and thermal efficiency of a fully insulated thermoelectric power generator with variable thermal conductivity and electrical resistivity. The Seebeck coefficients are assumed constant. The thermal conductivity and electrical resistivity are assumed to be hyperbolic and logarithmic functions of temperature, respectively. The results show that both power output and efficiency increase as the slope of the resistivity vs temperature curve increases. When the electrical resistivity is constant, variable thermal conductivity does not affect the maximum power output, but it does decrease the thermal efficiency. The constant-property analysis yields a better approximation to the maximum power output and the maximum thermal efficiency as the product of the figure of merit (formed from properties evaluated at the average temperature) and the average temperature increases. The constant-property analysis serves as a better approximation to the thermal efficiency than to the power output. P.G.

A69-41363

MAGNETOHYDRODYNAMICS (MAGNETODINAMICA FLUIDELOR).

Łazăr Dragoș.

Bucharest, Editura Academiei Republicii Socialiste România, 1969. 476 p. 390 refs. In Rumanian.

An attempt is made to present as precise a mathematical model as possible of the phenomena occurring in the branch of science called magnetohydrodynamics. It is therefore deemed necessary to begin this study by introducing the electromagnetic field equations for continuous flows such as the fluid flows to be considered. In contrast to other works in this field, where the constitutive equations are not mentioned, Ohm's law for moving media and two other constitutive laws for media at rest are introduced, without stating specifically in which hypothesis this approximation is valid. The

magnetohydrodynamics equations are given in integral form, and the differential equations valid for continuous flows are then derived. From the general equations conclusions relative to fluid flow in a magnetic field, the conservation of magnetic lines, turbulent flow, the existence of Bernoulli equations, etc., are deduced. As an immediate application of the flow equations, a study is made of viscous plane-parallel fluid flow and of flow in pipes. A general boundary value problem is formulated, and classical solutions for flows in pipes with rectangular cross sections are considered. A detailed examination is made of the theory of MHD generators. A mathematical model is presented based on the hypothesis that the electrodes are finite, that the magnetic field is applied only in the region of the electrodes, that the fluid is incompressible, and that the flow is steady and plane. The problem is reduced to the integration of a system of second-order partial differential equations with discontinuous or distributed coefficients. The Hall effect and the influence of the induced magnetic field are also studied. The theory of slender profiles in magnetoaerodynamics is considered. A study is made of perfectly conducting incompressible fluid flows and of flows with electromagnetic dissipative effects, the findings are extended to the case of compressible flows, and some general remarks are made about linearized theory. The problem of viscous fluid flows in the presence of slender cylindrical bodies is considered, with special reference to flows in the presence of flat plates at an angle of attack and at zero angle of attack. An investigation is made of discontinuities in magnetohydrodynamics. The case of weak discontinuities or of discontinuities of derivatives of characteristic dimensions is considered, and the findings are extended to the case of strong discontinuities or of discontinuities of the characteristic dimensions themselves. The study of weak discontinuities is based on the general theory of quasi-linear equations and the Cauchy problem. In this connection, it is shown how perfectly conducting fluids can arise, what their propagation velocities are, wavefronts are constructed, and an analytical Cauchy problem is solved. In the case of shock phenomena, the shock equations are given, as well as the geometrical and thermodynamic properties of the fluid flows, and the problem of stability of shock waves is considered.

A.B.K.

A69-42236

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTER-SOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969. 1186 p. Members, \$30; nonmembers, \$40.

CONTENTS:

SUMMARIES OF SESSIONS, p. xv-xxxiii.

DYNAMIC CYCLES—RANKINE. I.

ORGANIC RANKINE CYCLE WITH RECIPROCATING ENGINE. D. T. Morgan, E. F. Doyle, and S. S. Kitrilakis (Thermo Electron Corp., Waltham, Mass.), p. 1-10.

JET CONDENSER DEVELOPMENT FOR AN ORGANIC RANKINE-CYCLE POWER CONVERSION SYSTEM. R. Garcia (Aerojet-General Corp., Azusa, Calif.), p. 11-20.

DESIGN OF A PRACTICAL HYDROCARBON BOILER. J. P. Norton (American Air Filter Co., Inc., St. Louis, Mo.), p. 21-25.

SPACE POWER. I.

COMPUTER ANALYSIS OF SPACE POWER SYSTEMS FOR MISSION ANALYSIS. R. D. Arno (NASA, Office of Advanced Research and Technology, Moffett Field, Calif.), p. 26-32.

COMPUTER SIMULATION OF SATELLITE ELECTRIC POWER SYSTEMS. P. Bauer (TRW Systems Group, Redondo Beach, Calif.), p. 33-41.

PERFORMANCE ANALYSIS OF SATELLITE ELECTRIC POWER SYSTEMS BY COMPUTER SIMULATION. M. Schwartzburg (TRW Systems Group, Redondo Beach, Calif.), p. 42-50.

SOLAR CELL POWER SYSTEMS FOR MANNED SPACE STATIONS. H. Weiner (McDonnell Douglas Corp., Santa Monica, Calif.), p. 51-60. 8 refs.

OPTIMIZATION OF BATTERY SUBSYSTEMS FOR EARTH SATELLITE LIFETIMES OF GREATER THAN 5 YEARS. M. Koslover (TRW Systems Group, Redondo Beach, Calif.), p. 61-73.

POWER SYSTEMS FOR THE APOLLO APPLICATIONS PROGRAM. D. L. Daubert, W. H. Gross (Martin Marietta Corp., Denver, Colo.), C. B. Graff (NASA, Marshall Space Flight Center, Huntsville, Ala.), and J. D. Murrell (NASA, Manned Spacecraft Center, Houston, Tex.), p. 74-83.

BIOMEDICAL POWER. I.

ENERGY SYSTEM REQUIREMENTS FOR A HEART ASSIST-DEVICE. P. M. Newgard and G. J. Eilers (Stanford Research Institute, Menlo Park, Calif.), p. 84-88.

ENERGY TRANSMISSION THROUGH INTACT SKIN. L. A. Heimlich, F. H. Christiansen (United Aircraft Corp., Farmington, Conn.), and T. Sato (Yale University, New Haven, Conn.), p. 89-94.

ELECTROMECHANICAL ENERGY CONVERSION FOR ARTIFICIAL HEARTS—A NEW CONCEPT UTILIZING A ROTATING MOTOR. W. S. Kelly and R. D. Crosier (Battelle Memorial Institute, Richland, Wash.), p. 95-100.

NUCLEAR ELECTRIC POWER SOURCES FOR BIOMEDICAL APPLICATIONS. D. E. Knapp, A. Bennett, J. G. DeStesse, L. C. Olsen, E. W. Saaski, B. I. Griffin, and K. A. Gasper (McDonnell Douglas Corp., Richland, Wash.), p. 101-106.

DEVELOPMENT OF AN IMPLANTABLE ARTIFICIAL HEAT POWER SOURCE EMPLOYING A THERMOCOMPRESSOR. W. R. Martini (McDonnell Douglas Corp., Richland, Wash.), p. 107-114.

DEVELOPMENT OF A STIRLING CYCLE POWER SYSTEM FOR ARTIFICIAL HEARTS. K. E. Buck (Aerojet-General Corp., San Ramon, Calif.), p. 115-121.

THERMIONIC POWER. I.

THERMIONIC REACTOR CONCEPTS. L. K. Price (U.S. Atomic Energy Commission, Washington, D.C.), p. 122-130. 11 refs.

THERMIONIC FUEL ELEMENT DEVELOPMENT. D. S. Beard (U.S. Atomic Energy Commission, Washington, D.C.), p. 131-136.

FRENCH THERMIONIC PROGRAM AND ACCOMPLISHMENTS. B. Devin (Commissariat à l'Energie Atomique, Gif-sur-Yvette, Essonne, France), p. 137-145. 9 refs.

NUCLEAR POWER AND HYBRIDS.

SNAP-21 10-WATT THERMOELECTRIC POWER SYSTEM. F. K. Fox (3M Co., Roseville, Minn.) and L. R. Niendorf (Union Carbide Corp., Linde Div.), p. 146-152.

SNAP-27 PROGRAM REVIEW. A. A. Pitrolo (General Electric Co., Philadelphia, Pa.), B. J. Rock (U.S. Atomic Energy Commission, Washington, D.C.), W. Remini (NASA, Manned Spacecraft Center, Houston, Tex.), and J. A. Leonard (Sandia Corp., Albuquerque, N. Mex.), p. 153-170.

THE ROLE OF NUCLEAR POWER ENERGY CENTERS IN DEVELOPING ECONOMY. J. M. Holmes (Oak Ridge National Laboratory, Oak Ridge, Tenn.), p. 171-175.

CONTROLLED THERMONUCLEAR POWER. B. Myers, R. W. Werner, J. D. Lee, and P. B. Mohr (California University, Livermore, Calif.), p. 176-187.

THE WESTERN COAL DEPOSITS—A NATIONAL SOURCE OF POWER AND URANIUM. M. Steinberg, J. Powell, and B.

Manowitz (Brookhaven National Laboratory, Upton, N.Y.), p. 188-206.

DYNAMIC CYCLES—RANKINE. II.

EFFECT OF PRESSURE RATIO ON THE PERFORMANCE OF SUPERSONIC TURBINE-NOZZLES. R. E. Barber (Barber-Nichols Engineering Co., Arvada, Colo.), p. 207-225. 12 refs.

COMPARATIVE PERFORMANCE ANALYSIS OF SUPERCRITICAL FLUID POWER CYCLES. A. V. Pradhan, p. 226-236.

OPTIMIZING A 5 BHP STEAM TURBINE DESIGN. P. F. Swenson, Jr. (Swenson Research, Inc., Bedford Heights, Ohio) and E. N. Poulos (Prototherm Research Laboratories, Inc., Cleveland, Ohio), p. 237-252.

DESIGN OF VAPOR TURBINES INCLUDING EFFECTS OF SUPERSATURATION. K. E. Boyd, E. A. Mock, and R. A. Rackley (Garrett Corp., Phoenix, Ariz.), p. 253-260. 13 refs.

ROTARY STEAM ENGINE. P. O. Tauson (Westinghouse Electric Corp., Pittsburgh, Pa.), p. 261-270.

SPACE POWER. II.

IMPACTABLE POWER SUBSYSTEMS FOR MARS LANDERS. M. Swerdling (California Institute of Technology, Pasadena, Calif.), p. 271-283. 10 refs.

THERMAL MODEL OF A 75 WATT(E) SPACE POWER-PLANAR RTG SYSTEM. A. J. Parker, Jr. (Hittman Associates, Inc., Columbia, Md.) and W. S. West (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 284-299.

STATUS REPORT ON SMALL REACTOR-THERMOELECTRIC POWER SYSTEMS FOR UNMANNED SPACE APPLICATIONS. J. D. Gylfe and J. H. VanOsdol (North American Rockwell Corp., Canoga Park, Calif.), p. 300-307.

25 KWE REACTOR-THERMOELECTRIC POWER SYSTEM FOR MANNED ORBITING SPACE STATIONS. J. D. Gylfe, R. A. Johnson (North American Rockwell Corp., Canoga Park, Calif.), R. A. DuVal (U.S. Atomic Energy Commission, Canoga Park, Calif.), and L. W. Brantley (NASA, Marshall Space Flight Center, Huntsville, Ala.), p. 308-320.

THE COMPACT Co-60 KERNEL FOR SPACE POWER. W. Ruehle and D. L. Forrest (Aerojet-General Corp., San Ramon, Calif.), p. 321-329.

BIOMEDICAL POWER. II.

THE NEW MERCURIC OXIDE-CADMIUM (MERCADI) BATTERY SYSTEM FOR MEDICAL AND IMPLANTATION APPLICATIONS. M. Eisenberg (Electrochimica Corp., Menlo Park, Calif.), p. 330-338.

STUDIES OF IMPLANTABLE NICKEL CADMIUM-CELLS FOR HEART ASSIST DEVICES. R. P. Hamlen, E. G. Siwek (General Electric Co., Schenectady, N.Y.), G. Rampel (General Electric Co., Gainesville, Fla.), L. D. Wechsler, and J. Zampini (General Electric Co., Syracuse, N.Y.), p. 339-345.

AN IMPLANTABLE BIOLOGICAL FUEL CELL WITH AN AIRBREATHING CATHODE. A. J. Appleby, D. Y. C. Ng (Institute of Gas Technology, Chicago, Ill.), S. K. Wolfson, Jr. (Michael Reese Hospital Medical Center, Chicago, Ill.), and H. Weinstein (Illinois Institute of Technology, Chicago, Ill.), p. 346-353.

LIMITATIONS OF BLOOD PLASMA AS A FUEL CELL ELECTROLYTE. M. Beltzer and J. S. Batzold (Esso Research and Engineering Co., Linden, N.J.), p. 354-360.

TROPICALLY POWERED FUEL CELL POWER SUPPLY FOR THE ARTIFICIAL HEART. S. Messinger and R. F. Drake (American Hospital Supply Corp., Everett, Mass.), p. 361-369.

THERMIONIC POWER. II.

PRESENT STATUS OF DEVELOPMENT OF THERMIONIC DIODES AND THERMIONIC REACTORS IN THE FEDERAL REPUBLIC OF GERMANY. K. Einfeld (Internationaler Atomreaktorbau GmbH, Bensberg, West Germany), p. 370-382. 23 refs.

THE USE OF ION SPUTTERING IN MAKING ELECTRODES FOR THERMIONIC ENERGY CONVERTERS. J. Kramer

(Výzkumný Ústav Silnoproudé Elektrotechniky, Běchovice, Czechoslovakia), p. 383-385.

THERMOELECTRIC POWER.

SILICON GERMANIUM AIR-VAC TECHNOLOGY—A STATUS REPORT. R. E. Berlin, L. H. Gnau, and R. S. Nelson (Radio Corporation of America, Harrison, N.J.), p. 386-394.

DESIGN AND PERFORMANCE ANALYSIS OF SILICON-GERMANIUM RTG's. V. Raag (Resalab Scientific, Menlo Park, Calif.), p. 395-399. 6 refs.

PRACTICAL APPLICATIONS OF MULTI-LAYER INSULATIONS. F. Notaro, G. E. Nies (Union Carbide Corp., Tonawanda, N.Y.), and R. Hedel (Radio Corporation of America, Harrison, N.J.), p. 400-407.

THE MULTI-FOIL THERMAL INSULATION DEVELOPMENT PROGRAM—A STATUS REPORT. M. L. Paquin (Thermo Electron Corp., Waltham, Mass.), p. 408-415.

LIFE AND PERFORMANCE CHARACTERISTICS OF Pb-Te COUPLES IN HYDROCARBON FIRED SYSTEMS. A. Herchakowski (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 416-419.

FURTHER DEVELOPMENT OF THE STAR THERMOELECTRIC PANEL. N. C. Miller (North American Rockwell Corp., Canoga Park, Calif.), p. 420-424.

A MODEL TO DESCRIBE LONG-TERM PERFORMANCE CHARACTERISTICS OF PRESSURE CONTACTED LEAD-TELLURIDE THERMOELECTRIC GENERATORS. D. R. Field and G. W. Bunde (3M Co., St. Paul, Minn.), p. 425-435. 16 refs.

THE PERFORMANCE EVALUATION AND LIFE TESTING OF THERMOELECTRIC GENERATORS AT THE JET PROPULSION LABORATORY. P. Rouklove and V. Truscillo (California Institute of Technology, Pasadena, Calif.), p. 436-446.

DYNAMIC CYCLES—RANKINE. III.

AN ORGANIC RANKINE CYCLE FOR MANNED SPACE APPLICATIONS. S. D. Diamond and A. M. Taylor (McDonnell Douglas Corp., Santa Monica, Calif.), p. 447-455. 5 refs.

ZIRCONIUM HYDRIDE REACTOR-ORGANIC RANKINE POWER SYSTEMS. J. H. VanOsdol, F. R. Wilson (North American Rockwell Corp., Canoga Park, Calif.), and R. E. Niggemann (Sundstrand Corp., Rockford, Ill.), p. 456-464.

STUDY OF A 300 kWe RANKINE CYCLE ADVANCED NUCLEAR-ELECTRIC SPACE POWER SYSTEM. J. A. Heller, T. A. Moss, and G. J. Barna (NASA, Lewis Research Center, Cleveland, Ohio), p. 465-483. 19 refs.

DESIGN AND PERFORMANCE OF A MOBILE WASTE HEAT ORGANIC RANKINE CYCLE SYSTEM PROVIDING ELECTRIC POWER AND ENVIRONMENTAL CONTROL. E. Kaplan and E. Lodwig (Fairchild Hiller Corp., Bay Shore, N.Y.), p. 484-493.

SPACE POWER. III.

RADIOISOTOPE THERMAL ENERGY SOURCES FOR SPACE STATION LIFE SUPPORT SYSTEMS. R. V. Elms, Jr. and H. H. Greenfield (Lockheed Aircraft Corp., Sunnyvale, Calif.), p. 494-504. 5 refs.

ELECTRICAL/THERMAL INTEGRATION OF DYNAMIC POWER AND LIFE SUPPORT SYSTEMS FOR MANNED SPACECRAFT. C. H. Shinbrot and J. V. Coggi (McDonnell Douglas Corp., Santa Monica, Calif.), p. 505-514. 14 refs.

ISOTEC THERMOELECTRIC GENERATOR FOR SPACE POWER. E. J. Steeger and J. E. Cruver (Gulf General Atomic, Inc., San Diego, Calif.), p. 515-521.

ELECTROCHEMICAL POWER. I.

NEW LOW TEMPERATURE BATTERIES. N. T. Wilburn and A. L. Almerini (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 522-524.

05 ENERGY CONVERSION

RESERVE TYPE ORGANIC ELECTROLYTE BATTERIES. K. H. M. Brauer (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 525-527.

HIGH ENERGY LITHIUM-ORGANIC ELECTROLYTE BATTERIES FOR WIDE TEMPERATURE RANGE APPLICATIONS. M. Eisenberg (Electrochimica Corp., Menlo Park, Calif.), p. 528-537.

SECONDARY CELLS WITH LITHIUM ANODES AND PASTE ELECTROLYTES. H. Shimotake, A. K. Fischer, and E. J. Cairns (Argonne National Laboratory, Argonne, Ill.), p. 538-547.

LONG LIFE THERMAL CELL. J. R. Moser, H. J. Goldsmith, and R. L. Blucher (Catalyst Research Corp., Baltimore, Md.), p. 548-554.

PHOTOVOLTAIC POWER. I.

CHARACTERISTICS OF GaAs PHOTOVOLTAIC DIODES AT LOW IRRADIANCE. R. Kalibjian and K. Mayeda (California University, Livermore, Calif.), p. 555-560.

A TECHNIQUE FOR IDENTIFYING THE CAUSE OF PERFORMANCE DEGRADATION IN CADMIUM SULFIDE SOLAR CELLS. K. L. Kennerud (Boeing Co., Seattle, Wash.), p. 561-566.

EVALUATION OF INTEGRAL COVERS ON SILICON SOLAR CELLS. J. W. Fairbanks (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 567-574. 6 refs.

THE "HOT SPOT" FAILURE MODE FOR SOLAR ARRAYS. F. A. Blake and K. L. Hanson (General Electric Co., Philadelphia, Pa.), p. 575-581.

TEMPERATURE CYCLING EFFECTS ON SOLAR PANELS. W. Luft and E. Maiden (TRW Systems Group, Redondo Beach, Calif.), p. 582-589.

CHEMICAL AND PHYSICAL SYSTEMS.

A DEMONSTRATION OF THE FEASIBILITY OF ALL-SOLID, EXOTHERMIC REACTIONS AS CHEMICAL HEAT SOURCES SUITABLE FOR SPACECRAFT THERMAL CONTROL. R. W. Riebling (California Institute of Technology, Pasadena, Calif.), p. 590-598. 5 refs.

THE DYNAMIC PERFORMANCE OF A THERMODYNAMIC CYCLE USING A CHEMICALLY REACTIVE GAS. C. H. Wolgemuth (Pennsylvania State University, University Park, Pa.), p. 599-605.

A WIND ENERGY STORAGE AND CONVERSION SYSTEM FOR USE IN UNDERDEVELOPED COUNTRIES. R. Ramakumar, H. J. Allison, W. L. Hughes, and K. A. McCollom (Oklahoma State University, Stillwater, Okla.), p. 606-613.

USING THE RANKINE POWER CYCLE FOR FLUID EVALUATION. O. E. Buxton, Jr. (Ohio State University, Columbus, Ohio), p. 614-623. 8 refs.

ANALYSIS OF AN OSCILLATING ENGINE FOR POWER GENERATION BASED ON THE "DRINKING BIRD" PRINCIPLE. S. S. Shergill and R. P. Morgan (Missouri University, Columbia, Mo.), p. 624-638; Appendix, J. P. Fraser (General Electric Co., Schenectady, N.Y.), p. 639-641.

DYNAMIC CYCLES—BRAYTON, STIRLING. IV.

CLOSED BRAYTON CYCLE POWER SYSTEM APPLICATIONS. A. Pietsch (Garrett Corp., Phoenix, Ariz.), p. 642-651. 12 refs.

BRAYTON-B POWER SYSTEM—A PROGRESS REPORT. W. J. Brown (NASA, Lewis Research Center, Cleveland, Ohio), p. 652-658. 6 refs.

HOT PERFORMANCE CHARACTERISTICS OF A GAS BEARING BRAYTON CYCLE TURBOALTERNATOR. J. C. Wood, M. E. Valgora, and H. B. Tryon (NASA, Lewis Research Center, Cleveland, Ohio), p. 659-667. 12 refs.

ANALOG COMPUTER STUDIES OF A 2 TO 10 KILOWATTS ELECTRIC BRAYTON CYCLE SPACE POWER SYSTEM INCLUDING STARTUP AND SHUTDOWN. D. A. Cantoni and R. L. Thomas (NASA, Lewis Research Center, Cleveland, Ohio), p. 668-678.

THE RADIOISOTOPE ENERGIZED STIRLING ENGINE FOR SPACECRAFT AUXILIARY ELECTRIC POWER IN THE 250 TO 500 W(e) POWER RANGE. C. E. Leach and B. C. Fryer (Battelle Memorial Institute, Richland, Wash.), p. 679-691.

UNDERWATER POWER.

ECONOMIC SELECTION OF UNDERSEA POWERPLANTS. R. N. Edwards, J. A. Hill, and M. E. Cohen (General Electric Co., Philadelphia, Pa.), p. 692-698.

A LONG LIVED SEA WATER BATTERY. C. L. Opitz (Lockheed Aircraft Corp., Plainfield, N.J.), p. 699-704.

ELECTROCHEMICAL POWER.

PARAMETRIC CHARGE STUDIES FOR AEROSPACE NICKEL-CADMIUM BATTERIES. K. E. Preusse, R. C. Shair, F. E. Betz, and J. Sylvia (Gulton Industries, Inc., Metuchen, N.J.), p. 705-709.

ELECTRICAL CHARACTERISTICS OF A SEALED NICKEL-CADMIUM BATTERY HAVING A BIPOLAR CONSTRUCTION. H. N. Seiger, S. Charlip, and S. Lerner (Gulton Industries, Inc., Metuchen, N.J.), p. 710-714. 5 refs.

THE APPLICATION OF BENCH TESTS IN THE DEVELOPMENT OF HEAT-STERILIZABLE BATTERY SEPARATORS. W. von Hartmann (California Institute of Technology, Pasadena, Calif.), p. 715-720. 10 refs.

TWO YEAR FLIGHT PERFORMANCE OF THE LOCKHEED TYPE XI NICKEL-CADMIUM BATTERY. M. J. Teresa and R. E. Corbett (Lockheed Aircraft Corp., Sunnyvale, Calif.), p. 721-729. 5 refs.

PHOTOVOLTAIC POWER. II.

ATM SOLAR CELL MODULE PERFORMANCE TESTING. J. Bruno (Martin Marietta Corp., Denver, Colo.), p. 730-735.

EVALUATION OF THE PERFORMANCE OF SOLAR ARRAYS ON INTELSAT SPACECRAFT AT SYNCHRONOUS ALTITUDE. D. J. Curtin and J. F. Stockel (Communications Satellite Corp., Washington, D.C.), p. 736-742.

ADVANCED DESIGN MODULES FOR LUNAR SURFACE SOLAR ARRAY POWER SYSTEMS. J. E. Boretz (TRW Systems Group, Redondo Beach, Calif.) and J. L. Miller (NASA, Marshall Space Flight Center, Huntsville, Ala.), p. 743-753. 7 refs.

SOLAR ARRAY CONFIGURATIONS AND PERFORMANCE ON THE MARTIAN SURFACE. M. Swerdling and A. Hasbach (California Institute of Technology, Pasadena, Calif.), p. 754-762. 7 refs.

40 WATTS/POUND SPACECRAFT SOLAR ARRAYS. P. A. Dillard (TRW Systems Group, Redondo Beach, Calif.), p. 763-771. 7 refs.

LIGHTWEIGHT LARGE AREA SOLAR ARRAYS. D. D. Abbott (Boeing Co., Seattle, Wash.), p. 772-777. 20 refs.

TRANSPORTATION. I.

GROUND TRANSPORTATION ENERGY TRANSFER. E. J. Ward and K. L. Lawson (U.S. Department of Transportation, Washington, D.C.), p. 778-794.

LINEAR INDUCTION MOTOR FOR HIGH SPEED TRACKED VEHICLES. K. M. Chirgwin, C. H. Lee (Garrett Corp., Torrance, Calif.), and P. J. Larsen (U.S. Department of Transportation, Washington, D.C.), p. 795-806.

ELECTRIC PROPULSION SYSTEM FOR LINEAR INDUCTION MOTOR TEST VEHICLE. G. P. Kalman, D. Irani, and A. U. Simpson (Garrett Corp., Torrance, Calif.), p. 807-817.

A CONTRIBUTION OF THE LIQUID-METAL INDUCTION-MHD-CONVERTER-THEORY TO THE CALCULATIONS OF THE LINEAR MOTOR FOR VERY HIGH SPEED GROUND-VEHICLES. C. Carpetis, A. Gann, and W. Peschka (Deutsche Forschungs- und

Versuchsanstalt für Luft- und Raumfahrt, Stuttgart, West Germany), p. 818-825.

POWER CONDITIONING. I.

HIGH QUALITY ELECTRIC POWER PROGRAM. H. H. Kajihara (U.S. Naval Civil Engineering Laboratory, Port Hueneme, Calif.), p. 826-829.

MODULARIZATION OF HIGH-POWER INVERTERS AND CONVERTERS. F. Gourash (NASA, Lewis Research Center, Cleveland, Ohio), P. F. Pittman (Westinghouse Electric Co., Pittsburgh, Pa.), and J. F. Heins (Westinghouse Electric Corp., Lima, Ohio), p. 830-838. 5 refs.

A DUTY CYCLE GENERATOR FOR SWITCHING REGULATORS. A. Schloss (California Institute of Technology, Pasadena, Calif.) and P. Gutknecht (Westinghouse Electric Corp., Pittsburgh, Pa.), p. 839-843. 8 refs.

POWER PROCESSING AND CONTROL FOR MILITARY MANPACK FUEL CELL POWER SOURCES. W. B. Kempler and M. E. Cannon (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 844-853.

1 KVA THREE-PHASE DC-AC INVERTER WITH DIGITAL CONTROL. M. Knight (U.S. Naval Air Systems Command, Washington, D.C.) and R. Torkildsen (General Electric Co., Lynn, Mass.), p. 854-860.

HEAT PIPES. I.

HEAT PIPE THERMIONIC CONVERTER RESEARCH IN EUROPE. C. A. Busse (EURATOM and Comitato Nazionale per l'Energia Nucleare, Ispra, Italy), p. 861-872. 47 refs.

THE HEAT PIPE—A PROGRESS REPORT. G. Y. Eastman (Radio Corporation of America, Lancaster, Pa.), p. 873-878.

HEAT PIPE DEVELOPMENT FOR THERMIONIC APPLICATIONS. P. K. Shefsiek and D. M. Ernst (Thermo Electron Corp., Waltham, Mass.), p. 879-887. 10 refs.

EXPERIMENTAL DETERMINATION OF WICK PROPERTIES FOR HEAT PIPE APPLICATIONS. R. A. Freggens (Radio Corporation of America, Lancaster, Pa.), p. 888-897.

ELECTROCHEMICAL POWER. III.

DEVELOPMENT OF NEW MATERIALS OF CONSTRUCTION FOR FUEL CELLS. R. R. Sayano, R. A. Mendelson, M. E. Kirkpatrick, E. T. Seo, and H. P. Silverman (TRW Systems Group, Redondo Beach, Calif.), p. 898-903.

AN ALUMINUM-HYDROGEN PEROXIDE POWER SOURCE. S. Zaromb (Zaromb Research Corp., Passaic, N.J.), p. 904-910.

HIGH RATE PERFORMANCE OF ZINC-AIR BATTERIES. N. I. Palmer, B. E. Jagid, and F. J. Staudinger (Leesona Corp., Lake Success, N.Y.), p. 911-919.

PURGE DYNAMICS OF FUEL CELLS. D. Gidaspow and S. S. Sareen (Institute of Gas Technology, Chicago, Ill.), p. 920-932. 14 refs.

TRANSPORTATION. II.

ENERGY CONVERSION DEVICES IN GROUND TRANSPORTATION. G. G. Leeth (General Electric Co., Santa Barbara, Calif.), p. 933-939.

ENERGY TRANSFORMATIONS IN TUBEFLIGHT PROPULSION. J. V. Foa (Rensselaer Polytechnic Institute, Troy, N.Y.), p. 940-952.

MAGNETICALLY SUSPENDED TRAINS FOR VERY HIGH SPEED TRANSPORT. J. R. Powell and G. T. Danby (Brookhaven National Laboratory, Upton, N.Y.), p. 953-963.

LINEAR INDUCTION MOTOR FOR HIGH SPEED GROUND TRANSPORTATION. T. C. Wang (National Taiwan University, Taiwan, China), p. 964-974.

POWER CONDITIONING. II.

POWER CONDITIONING DEVELOPMENT FOR THE SERT II ION THRUSTOR. A. C. Hoffman (NASA, Lewis Research Center, Cleveland, Ohio), R. W. Briggs, E. F. Swiderski, S. F. Bauer, and R.

M. Weger (Westinghouse Electric Corp., Lima, Ohio), p. 975-986. 8 refs.

HIGH FREQUENCY CAPABILITIES OF A NEW POWER THYRISTOR. R. L. Davies (General Electric Co., Auburn, N.Y.), p. 987-991.

ULTRA-RELIABLE POWER PROCESSOR FOR HYDRO-CARBON-AIR FUEL CELL POWER SYSTEMS. M. S. Kosmin (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 992-999.

HIGH-EFFICIENCY BOOST REGULATOR DESIGN FOR PLANETARY SPACECRAFT. D. J. Hopper (California Institute of Technology, Pasadena, Calif.), p. 1000-1003.

TRACKING SOLAR ARRAY MAXIMUM POWER BY SENSING ARRAY TEMPERATURE. M. Sussman (NASA, Langley Research Center, Hampton, Va.), p. 1004-1009. 7 refs.

HEAT PIPES. II.

DEVELOPMENT OF AN ADVANCED SPACE RADIATION SYSTEM. J. T. Peters and R. G. Hannah (Isotopes, Inc., Baltimore, Md.), p. 1010-1015.

AVIONIC APPLICATION OF A HEAT PIPE. A. T. Calimbas and R. H. Hulett (Philco-Ford Corp., Palo Alto, Calif.), p. 1016-1024. 8 refs.

EXPERIMENTS WITH A TWO-FLUID HEAT PIPE. K. T. Feldman, Jr. (New Mexico University, Albuquerque, N. Mex.) and G. L. Whitlow (Energy Conversion Systems, Inc., Albuquerque, N. Mex.), p. 1025-1032. 7 refs.

HEAT PIPES FOR TEMPERATURE CONTROL. W. Bienert (Dyna-Therm Corp., Cockeysville, Md.), p. 1033-1041. 9 refs.

ELECTROCHEMICAL POWER. IV.

ECONOMIC HIGH-PRESSURE HYDROGEN-OXYGEN REGENERATIVE FUEL-CELL SYSTEMS. H. J. Allison, R. Ramakumar, and W. L. Hughes (Oklahoma State University, Stillwater, Okla.), p. 1042-1047. 10 refs.

AMMONIA-AIR FUEL CELL SYSTEM. P. L. Terry and O. J. Adlhart (Engelhard Minerals and Chemicals Corp., Newark, N.J.), p. 1048-1051.

THE HYDRAZINE-AIR BI CELL, A SIMPLIFIED FUEL CELL SYSTEM. J. Perry, Jr. and L. J. Rogers (U.S. Army, Electronics Command, Fort Monmouth, N.J.), p. 1052-1056.

A CIRCULATING ELECTROLYTE HYDROGEN/AIR FUEL CELL SYSTEM. C. G. Clow and J. G. Bannochie (Energy Conversion, Ltd., Basingstoke, England), p. 1057-1064.

HIGH POWER DENSITY FUEL CELL. B. Durante (USAF, Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio), J. K. Stedman, and C. Z. Bushnell (United Aircraft Corp., South Windsor, Conn.), p. 1065-1071.

USER REQUIREMENTS.

STRATEGIES FOR A NATIONAL NUCLEAR ENGINEERING PROGRAM. C. Starr and C. B. Smith (California, University, Los Angeles, Calif.), p. 1072-1080.

A69-42260

DESIGN AND PERFORMANCE ANALYSIS OF SILICON-GERMANIUM RTG's.

Valvo Raag (Resalab Scientific, Menlo Park, Calif.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p.

05 ENERGY CONVERSION

395-399, 6 refs.

AEC Contract No. AT (29-2)-2510.

Description of a newly developed analytical technique for the design and performance analysis of radioisotope thermoelectric generators (RTGs). Although of general applicability to RTGs, the newly developed design technique has specifically been developed for generators that use silicon-germanium Air-Vac type thermocouples. The application of the technique to a particular silicon-germanium generator is illustrated in terms of calculated and actual measured performance. (Author)

A69-42261

FURTHER DEVELOPMENT OF THE STAR THERMOELECTRIC PANEL.

Norman C. Miller (North American Rockwell Corp., Atomics International Div., Canoga Park, Calif.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p. 420-424.

Description of an improved version of the original four-couple section of the Stud and Rocker (STAR) Panel. The new experimental couples incorporate bonded tungsten electrical contacts for the PbTe thermoelectric elements, allowing stable operation at temperatures above 800 deg F. Thermal insulation efficiency has been improved, also. Operational test data show a measured conversion efficiency for the experimental assembly, including all losses, greater than 4.2 per cent. The actual couple efficiency is probably in excess of 4.8 per cent. The life test graph of power output vs time indicates that the stability is consistent with a 3- to 5-year useful life. (Author)

A69-42267

DESIGN AND PERFORMANCE OF A MOBILE WASTE HEAT ORGANIC RANKINE CYCLE SYSTEM PROVIDING ELECTRIC POWER AND ENVIRONMENTAL CONTROL.

Eli Kaplan and Erwin Lodwig (Fairchild Hiller Corp., Stratos Div., Bay Shore, N.Y.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p. 484-493.

Description of an organic Rankine cycle power system which absorbs heat from the exhaust gas of a 30 kW gas turbine generator, producing an additional 18.9 kW to support electrical loads greater than the gas turbine rated capacity and to power an air conditioning system. Heat rejected from the system provides water and space heating and humidification. Descriptive material and prototype performance test data are included. (Author)

A69-42294

1 KVA THREE-PHASE DC-AC INVERTER WITH DIGITAL CONTROL.

Milton Knight (U.S. Naval Air Systems Command, Washington, D.C.) and Robert Torkildsen (General Electric Co., Lynn, Mass.).

IN: AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, 4TH, WASHINGTON, D.C., SEPTEMBER 22-26, 1969, PROCEEDINGS.

Conference co-sponsored by the American Institute of Aeronautics and Astronautics, the American Nuclear Society, the American Society of Mechanical Engineers, the American Chemical Society, the Institute of Electrical and Electronics Engineers, and the Society of Automotive Engineers.

New York, American Institute of Chemical Engineers, 1969, p. 854-860.

Contract No. N 00019-67-C-0546.

Description of a three phase dc-ac inverter showing a low harmonic distortion, good efficiency and packaging capability, and an ability to handle a wide range of load power factors. The frequency is easily stabilized by a simple crystal-controlled clock oscillator holding the output frequency within a few parts per million frequency drift. The basic pulse repetition rate of 9.6 kHz was selected as a compromise between the weight of transformer and filter components and the switching losses which would be encountered in the transistors. Test results on the unit proved the insensitivity of output waveform to load power factor. The efficiency measured at full load is 85 per cent. The package volume of the model described is 0.52 cu ft and its weight is 19.5 lb. P.G.

A70-10754

CASCADED THERMOELEMENTS AND METHODS OF THEIR DESIGN.

M. Gaibnazarov and Iu. N. Malevskii (Gosudarstvennyi Nauchno-Issledovatel'skii Energeticheskii Institut, Moscow, USSR).

IN: SEMICONDUCTOR SOLAR ENERGY CONVERTERS.

Edited by V. A. Baum.

(Translation of Preobrazovatel'i Solnechnoi Energii na Poluprovodnikovakh, Moscow, Izdatel'stvo Nauka, 1968.)

New York, Consultants Bureau, 1969, p. 23-29. 19 refs.

Study of the design and operation of cascaded thermoelements. Some of the most efficient materials, having a sufficiently high figure of merit in a cascaded thermoelement, are identified. Calculated and experimental results are employed to demonstrate that the use of such materials in cascades makes it possible to increase the efficiency of thermoelectric energy converters up to 10 to 14 per cent at working temperatures of 600 to 700 deg C. A description is given of the first practical use of cascaded thermoelements in a solar thermoelectric generator operating with a 380 deg C temperature drop between the hot and cold junctions with an efficiency of 6.5 per cent. Further increase of the hot-junction temperature by employing high-temperature materials in cascades should make it possible to reach even higher efficiencies. (Author)

A70-12068

CO₂ LASER-INDUCED THERMIONIC EMISSION FROM METALS-DIRECT ENERGY CONVERSION.

W. W. Duley (York University, Science and Physics Dept., Centre for Research in Experimental Space, Toronto, Canada).

Canadian Journal of Physics, vol. 47, Nov. 1, 1969, p. 2419-2423. 14 refs.

Discussion of the characteristics of thermionic emission from tungsten and molybdenum targets subjected to focused carbon-dioxide laser radiation, for a variety of excitation conditions. The electron temperature is found to be roughly 8000 deg K for an incident power of 40 W CW. Direct energy conversion processes are discussed. Direct energy conversion is found to occur with surprising efficiency, even when a relatively crude geometrical arrangement of the electrodes is used. This indicates that high efficiencies may be obtained after optimizing the electrode configuration and electrode work function. Short-circuit currents of 2 to 7 microamp and open-circuit voltages between 0.1 and 0.4 V were observed. V.P.

A70-12513

ADVANCED RANKINE CYCLE PROVIDES BASIC TECHNOLOGY FOR OTHER POWERPLANTS AS WELL.

A. J. Wilson (General Electric Co., Cincinnati, Ohio).

American Institute of Chemical Engineers, Intersociety Energy Conversion Engineering Conference, 4th, Washington, D.C., Sept. 23-26, 1969, Paper 11c. 15 p. 19 refs.

Review of the technology of the advanced Rankine cycle power plant as it evolved over eight years, and of how the high-temperature, refractory alloy, and liquid-metal experience gained in the technology development is applicable to that required for the nuclear Brayton cycle and thermionic power systems. A comparison of technology requirements of the advanced Rankine cycle three-loop system, the three-loop Brayton cycle system, and the two-loop reactor thermionic power plant is given. The advanced Rankine cycle technology is then reviewed to point out the present status and show the relevancy to the needs of the Brayton cycle and thermionic power plants. It is shown that for all three systems the most attractive heat source is a compact fast spectrum nuclear reactor using an alkali-metal coolant which presents one of the most prominent features of the advanced Rankine cycle technology. The most significant advantage of such nuclear reactors is the minimum reactor vessel diameter resulting in minimum shielding weight, so that it may be effectively used in space. Heat-rejection systems of all three power plants may also be most effectively designed by the employment of liquid coolants. The employment of heat pipes as radiation fins attached to the liquid-coolant ducts may be an additional attractive possibility in any of the three systems. Finally, heat exchangers with liquid metals on one or both sides, pumps, valves, structural materials fabrication techniques, and liquid metal purification and handling techniques are all common to the three power plants. O.H.

A70-14716 #

PHYSICAL PHENOMENA IN MAGNETOHYDRODYNAMIC GENERATORS.

R. Țițeica, M. Stoenescu, and N. Lupas (Academia Română, Institutul de Fizică, Bucharest, Rumania).

Revue Roumaine de Physique, vol. 14, no. 9, 1969, p. 1023-1027.

Consideration of the operational principles and parameters of magnetohydrodynamic generators and their thermal efficiency. It is shown how optimum solutions for inlet parameters should be sought. The inlet values of the parameters and their variation along the conversion channel are given for a constant-speed laboratory model. F.R.L.

A70-14754 #

CRITIQUE OF MHD POWER GENERATION.

William D. Jackson, James E. Klepeis (Avco Corp., Avco Everett Research Laboratory, Everett, Mass.), and Michael Petrick (Argonne National Laboratory, Argonne, Ill.).

American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/Pwr-12. 20 p. 55 refs.

Members, \$1.00; nonmembers, \$2.00.

Discussion of the recent developments in the field of MHD generators, the status of MHD power generation, and its prospects for large-scale utilization. Several variations of the basic MHD scheme are considered, falling into the category of open-cycle and closed-cycle systems. Primary emphasis is placed on the application of MHD systems to commercial power networks as a means for substantially raising the efficiency of conversion of heat into electricity. O.H.

A70-14797 * #

ANALYTICAL AND EXPERIMENTAL STUDIES OF MHD GENERATOR CATHODES EMITTING IN "SPOT" MODE.

Lester D. Nichols and Maris A. Mantieniks (NASA, Lewis Research Center, Cleveland, Ohio).

*American Society of Mechanical Engineers, Winter Annual Meeting,**Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/HT-51. 12 p. 13 refs.*

Members, \$1.00; nonmembers, \$2.00.

Derivation of the current-sheath voltage characteristics of a plane cathode emitting current from a thermionic arc spot. The derivation is based upon the requirement of energy conservation at the cathode spot and also in an "ionization region" adjacent to the spot. The results for given gas conditions and electrode work function predict a sheath voltage which decreases with increasing current for a fixed undisturbed (i.e., far from the spot) cathode temperature and with increasing undisturbed cathode temperature at a fixed current. Experimental data support the conclusions predicted by the model. (Author)

A70-14896 * #

PERFORMANCE OF LIFE TESTS AND EFFICIENCY MEASUREMENTS FOR THERMOELECTRIC COUPLES AT CONSTANT THERMAL INPUT POWER.

Philip E. Eggers (Battelle Memorial Institute, Columbus, Ohio).

American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/Ener-14. 6 p.

Members, \$1.00; nonmembers, \$2.00.

Contract No. NAS 5-11644.

A test apparatus for the performance of thermoelectric-couple life tests and efficiency measurements at constant thermal input power. Particular emphasis was placed on the development of the thermal insulation system in order to limit parasitic heat losses from the heat source to less than ~15 per cent, hence simulating operating conditions typical of radioisotope-fueled thermoelectric generators. The results of efficiency measurements and a description of the test apparatus and calibration procedure are presented. (Author)

A70-14897 #

THERMAL STEADY-STATE CHARACTERIZATION OF ISOTEC RADIOISOTOPE THERMOELECTRIC GENERATOR.

R. J. Brislin and G. J. E. Willcutt, Jr. (Gulf General Atomic, Inc., San Diego, Calif.).

American Society of Mechanical Engineers, Winter Annual Meeting, Los Angeles, Calif., Nov. 16-20, 1969, Paper 69-WA/Ener-12. 7 p.

Members, \$1.00; nonmembers, \$2.00.

AEC Contract No. AT (29-2)-2564.

Description of the Gulf General Atomic's isotec thermoelectric generator which employs a series of ten power-producing thermoelectric panels arranged in an octagonal prism around a spherical radioisotope-decay heat source. Heat is transferred between the heat source and panels by radiation, through the panels by conduction, and then dissipated into space by radiation. Essential design features, simplified and detailed radiation and conduction heat transfer models for determination of system operating temperatures, and output performance, are considered. (Author)

A70-16470 #

A NEW STABLE HIGH POWER GIANT-PULSE LASER AT 0.53 μ USING LiIO_3 .

U. Deserno (Siemens AG, Munich, West Germany) and G. Nath (München, Technische Hochschule, Munich, West Germany).

Physics Letters, vol. 30A, Dec. 15, 1969, p. 483, 484. 9 refs.

Description of an intracavity experiment with a giant-pulse YAG laser using the new nonlinear material LiIO_3 . Using this material, complete conversion to the second harmonic is obtained. With 50 pulses per second, the green output remains stable in the 10 MW/sq cm intensity range. M.V.E.

A70-18107 #

INSTABILITIES IN NON-EQUILIBRIUM M.H.D. PLASMAS—A REVIEW.

Albert Solbes (MIT, Cambridge, Mass.).

American Institute of Aeronautics and Astronautics, Aerospace

05 ENERGY CONVERSION

Sciences Meeting, 8th, New York, N.Y., Jan. 19-21, 1970, Paper 70-40, 13 p. 63 refs.

Members, \$1.00; nonmembers, \$1.50.

USAF-supported research.

In the Hall parameter range (typically larger than 3) characteristic of non-equilibrium M.H.D. generators, alkali seeded noble gases are subject to electrothermal (ionization) instabilities. Plane-wave linear stability analyses led to the concept of a critical Hall parameter above which the plasma is unstable. The dependence of the critical Hall parameter on other plasma parameters has been studied both theoretically and experimentally, leading to a satisfactory agreement between results. Subsequently quasi and non linear analysis have been proposed, aimed at predicting the effect of the fully developed waves on plasma properties. More recently, theoretical and experimental investigations have focused on the wave stabilization problem and on the effect of boundary conditions. We present here a review of the above work and results.

(Author)

A70-19321

MHD GENERATOR CHARACTERISTICS WITH INSULATOR WALL LOSSES.

Reiner Decher (Washington, University, Seattle, Wash.).

AIAA Journal, vol. 8, Jan. 1970, p. 132-137. 8 refs.

The paper presents an analysis that delineates the important electrical effects of boundary layers on the insulator wall of a magnetohydrodynamic generator. For specified variation of the fluid properties associated with the boundary layer, the electrical characteristics may be used to identify shorting through the insulator wall boundary layer in an experimental investigation. Two numerical examples considering seeded gas MHD generators with equilibrium and nonequilibrium ionization show that if the channel dimension in the magnetic field direction is 10-100 times larger than the boundary-layer thickness, insulator wall shorting should have a negligible effect on the generator's performance. The equations are also generalized to investigate the effects of an insulator wall with finite scalar resistivity.

(Author)

A70-20703

Evaluation of molten carbonate fuel cells.

Walter G. Taschek (U.S. Army, Mobility Equipment Command, Fort Belvoir, Va.). In: Annual Power Sources Conference, 23rd, Atlantic City, N.J., May 20-22, 1969, Proceedings.

Conference sponsored by the U.S. Army. Red Bank, N.J., PSC Publications Committee, 1969, p. 22-25. 6 refs.

Examination of the nature of the problems confronting development of molten carbonate fuel cells, with discussion of new approaches to fuel conditioning. The primary problems associated with the fuel cell module are material and fabrication problems. Corrosion of cell components, difficulty in achieving leak-free structures, and failure to control the electrolyte over extended periods are often the cause of premature cell failure and poor performance. For military systems, the preferred approach appears to be a catalytic recycle reformer. Here a portion of the spent fuel is recycled back to the fuel conditioner to supply the needed reactants for the catalytic reforming reaction. It is considered that the molten carbonate fuel cell has the potential of being an attractive cost effective power source for military applications.

F.R.L.

A70-21274

Microwave power rectification with commercial Schottky barrier diodes. Alan C. Macpherson, Eliot D. Cohen, and Melvin Herndon (U.S. Navy, Naval Research Laboratory, Washington, D.C.). *Journal of Microwave Power*, vol. 4, Dec. 1969, p. 278-285. 7 refs.

The microwave rectification efficiency of several commercially available Schottky barrier diodes was measured between 1 and 7 GHz as a function of power input and dc load resistance. The highest efficiency observed was 89% with 0.6-watt power input at 1 GHz. For a higher-frequency diode, produced by the same manufacturer, efficiencies of 83 and 68% were observed at 4 GHz and 6.4 GHz respectively with an input power of 100 mW. A theory is developed

in which diode losses in the back and forward direction are described by four parameters: the back capacitance, the series resistance, the front resistance, and the 'knee' voltage. The diode is imbedded in a lumped circuit, and the efficiency is calculated. The theoretical dependence of the efficiency on the load resistance agrees quite well with the measurements, but the frequency dependence is less satisfactory.

(Author)

A70-22249

Controlled fusion—Plasma heating with lasers.

Robert Holcomb. *Science*, vol. 167, Feb. 20, 1970, p. 1112, 1113.

Discussion of the possibility that advances made in the production of powerful laser pulses during the past few years may help solve some of the problems of generating and heating plasmas. It is noted that the use of lasers in controlled thermonuclear reaction research is already widespread. Lasers are used for standard optical diagnostic techniques such as interferometry and scattering, and are used to study plasma dynamics and shock wave formation. They also have a unique capability in the generation of plasma holograms. These uses are enough to ensure the future of lasers in plasma research.

M.M.

A70-24156

The optimum load selection of a sectioned MHD generator. I. I. Shakhnov. In: Polska Akademia Nauk, Instytut Podstawowych Problemów Techniki, Symposium on Advanced Problems and Methods in Fluid Dynamics, 8th, Tarda, Poland, September 18-25, 1967, Proceedings.

Edited by W. Fiszdon, P. Kucharczyk, and W. J. Prosnak. Warsaw, Państwowe Wydawnictwo Naukowe (Fluid Dynamics Transactions, Volume 4), 1969, p. 665-669.

Investigation of the optimum load selection of sectioned MHD generators by using a method of stepwise approach. A method of stepwise finding of optimum energy transformation conditions is presented, the results of which indicate a satisfactory agreement of the pressure and density distribution, yielding thus a maximum power value for MHD generators as a whole.

O.H.

A70-24469

The catalytic effectiveness of nickel and nickel boride for anodic hydrazine oxidation on porous carbon electrodes (Die katalytische Wirksamkeit von Nickel und Nickelborid für die anodische Hydrazinoxidation an porösen Kohlelektroden). W. Wiesener (Zentralinstitut für Kernforschung, Rossendorf; Deutsche Akademie der Wissenschaften, Berlin, East Germany). In: Société d'Etudes de Recherches et d'Applications Scientifiques, International Symposium on Fuel Cells, 3rd, Brussels, Belgium, June 16-20, 1969, Proceedings.

Brussels, Presses Académiques Européennes, 1969, p. 215-219. In German.

Investigation of the suitability of carbon electrodes for use as anodes in the oxidation of hydrazine in fuel cells. Findings about the load carrying capacity of porous carbon electrodes impregnated with nickel salt and nickel boride are presented. It is felt that nickel boride and nickel salt possess very favorable catalytic properties for the oxidation of hydrazine and that they form excellent catalysts on porous carbon electrodes in hydrazine fuel cell system.

M.V.E.

A70-24570

General analysis of an optimal MHD generator with a channel of constant cross-sectional area (K obshchemu analizu optimal'nogo MGD-generatora s postoiannoii ploshchad'iu secheniia kanala). A. S. Pleshanov and P. P. Lazarev. *Magnitnaia Gidrodinamika*, vol. 5, Oct.-Dec. 1969, p. 9-12. In Russian.

Analysis of an analytical solution to the variational problem of optimizing a linear conduction MHD generator with a constant channel area. The solution studied was previously obtained by Pleshanov (1966) in a quasi-one-dimensional approximation for small Reynolds numbers and an ideal inviscid nonheat-conducting gas of arbitrary electrical conductivity. It is shown that the modes of operation of an MHD channel involving shock waves are not optimal.

V.P.

A70-24855 A cylindrical coaxial MHD generator. K. R. Rao (Texas, University, Arlington, Tex.) and A. Erteza (New Mexico, University, Albuquerque, N. Mex.). *Applied Scientific Research*, vol. 21, Jan. 1970, p. 427-441. 19 refs.

A MHD generator with a novel geometry is analyzed as a possible dc power source. The generator channel consists of two coaxial cylinders with a smooth annular space between them through which pressure driven ionized gas flows axially. Magnetic poles and electrodes separated by insulators are embedded in both the inner and outer cylinders. A one-dimensional steady state analysis is presented. It is shown that the internal impedance of the generator is a very sensitive function of the ratio of areas of the charge collecting electrodes to that of the magnetic poles. The generator efficiency analysis, on the other hand, indicates that there is an optimum area ratio corresponding to the maximum conversion efficiency. A comparison of the performance characteristics of this generator with those of a generator of rectangular cross section is presented. The average gas temperature and velocity, the magnetic flux density at the poles, and the volume displacement rate, etc., are assumed identical for the two cases in comparison. It is inferred that the novel channel analyzed herein is, in general, superior to the simple rectangular channel in the energy conversion scheme. (Author)

A70-25033 Commercial thermoelectric generator applications and economic considerations. M. A. Rubinstein (General Instrument Corp., Newark, N.J.). (*Intersociety Energy Conversion Engineering Conference, Boulder, Colo., Aug. 13-16, 1968.*) *Energy Conversion*, vol. 9, Dec. 1969, p. 123-129.

Conversion of heat directly to useful electrical energy by means of thermoelectric techniques has moved during the past few years from the laboratory to fully developed production hardware. A brief description is given of presently available commercial TEGs, the thermoelectric materials used and heat sources. The basis of the design of the TEGs is described in light of requirements for commercially acceptable units. A brief analysis is made of the economics of TEGs relative to other competitive power sources, such as batteries and small MG sets to show how TEGs fill a hole in the power spectrum. The inherent reliability and low maintenance needs of TEGs is considered to be of prime importance and demonstrated by presenting a series of applications in actual use and relevant operational and performance characteristics. (Author)

A70-25036 The contribution of space-charge in slender channel electrodynamics. D. M. France and G. J. Trezek (California, University, Berkeley, Calif.). *Energy Conversion*, vol. 9, Dec. 1969, p. 135-140.

Derivation of a general expression for the axially induced space charge electric field in an electrodynamics energy converter for an axially varying charge distribution. By introducing an effective value of the space charge electric field an analytic solution was obtained for the load current in a manner similar to an earlier theory proposed by Gourdine which is devoid of space charge effects. A comparison is made between computed values of the load current, voltage, and power output and experimental data for air over a range of load resistance from 10 to the 7th to 10 to the 11th ohms. The space charge electric field computed for the case of constant axial charge distribution was also considered. (Author)

A70-25371 Performance of a 35 HP organic Rankine cycle exhaust gas heat powered system. Erwin Lodwig (Fairchild Hiller Corp., Stratos Div., Bay Shore, N.Y.). *Society of Automotive Engineers, Automotive Engineering Congress, Detroit, Mich., Jan. 12-16, 1970, Paper 700160*. 32 p. Members, \$1.00; nonmembers, \$1.50. USAF-sponsored research.

An organic Rankine cycle system utilizing waste exhaust gas heat from a 30 KW gas turbine generator set has been built and tested. Utilizing a new fluorocarbon fluid, the system furnishes 18.9 KW of additional electrical power output along with 120,000

BTU/hour for air heating and 190,000 BTU/hour for water heating for environmental control. The primary gas turbine engine fuel control furnishes the speed control for the mechanically locked-in Rankine turbine and permits fuel saving operation under power sharing conditions from full load to idle conditions. This system concept provides electrical energy output at a fuel consumption rate approaching that of the diesel set but at a small fraction of the diesel set weight. (Author)

A70-25525 MHD power generation: Engineering aspects. G. J. Wornack (Central Electricity Generating Board, Marchwood Engineering Laboratories, Southampton, Hants., England). London, Chapman and Hall, Ltd.; New York, Barnes and Noble, Inc., 1969. 169 p. 91 refs. \$9.50.

A basic and comprehensive treatment of the engineering aspects of MHD power generation is presented. The ionization and electrical conductivity of the working gas is examined together with the motion of the conducting incompressible fluid in a magnetic field. Special attention is given to the Saha equation and its different forms. The electrodynamics of an MHD generating duct are considered, starting from simplified electrodynamics of MHD generators and description of the Hall effect of electrons and ions. The basic configurations of an MHD generator are then described and a summary is presented of the applications of the four generator configurations. Special attention is given to the background on which the generating duct geometry is selected. Topics discussed include the derivation of the MHD equations and their approximations, similarity criteria, steady-state compressible flow in Faraday-type MHD generators, and optimization of a generating duct. The various possible MHD power cycles are examined taking into account short-duration MHD generators, central power station MHD-steam generator cycles, liquid metal MHD generators, and conversion efficiency of the MHD generators. A discussion is presented of plant components of the whole MHD-steam plant including high-temperature air heater, combustion chamber, MHD generating duct, magnet, and seed recovery. The ac generation and losses in the MHD generating duct are briefly discussed. Z.W.

A70-25614 * # Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator. R. J. Sovie and L. D. Nichols (NASA, Lewis Research Center, Cleveland, Ohio). *Symposium on the Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., Mar. 24-26, 1970, Paper*. 12 p. 6 refs.

The NASA-Lewis closed loop MHD generator was designed to study power generation with nonequilibrium ionization using a cesium seeded argon plasma. The results of the first five tests, in which the general design and structural integrity of the loop were studied, have been reported on in a previous paper. This facility has been run subsonically seven times in the past year. These tests evaluated various loop subsystems necessary to supply the proper plasma conditions, such that the basic concepts of low-temperature MHD power generation can be studied. These subsystems include an impurity purge system, a new vapor cesium injection system, a multiple electrode sidewall pre-ionizer system and various starter electrode systems. The necessity of these systems and their performance characteristics are presented. The initial generator data obtained after incorporating these components into the facility are also presented and discussed. (Author)

A70-27330 # Electrodynamics generator with spatial charge neutralization (Elektrozodinamicheskii generator s neutralizatsiei prostranstvennogo zariada). A. M. Borok (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Tokov Vysokoi Chastoty, USSR). *Teplifizika Vysokikh Temperatur*, vol. 8, Jan.-Feb. 1970, p. 177-181. 6 refs. In Russian.

Development of a theoretical basis for constructing a high capacity electrodynamics generator performing direct thermal-to-electrical energy conversion. The operation of such a generator at

05 ENERGY CONVERSION

high gas pressures is analyzed. Engineering formulas for generator designs, with specifications for a generator operating at 200 atm and a generator using an aerosol, are given. It is concluded that the specific capacity of these designs may exceed 3000 kW/cu m, providing a high efficiency at relatively low temperatures. V.Z.

A70-27670 Energy conversion statics. H. K. Messerle (Sydney, University, Sydney, Australia). New York, Academic Press, Inc., 1969. 357 p. 29 refs. \$16.50.

This comprehensive work deals with energy, energy distribution under equilibrium conditions, and processes linking equilibrium states. It provides an original approach to a generalized treatment of energy conversion. A unified language is developed to handle energy conversion problems in fields ranging from thermostatics to electrical systems. The basic ideas are introduced through the use of single and two-port storage elements and systems of multi-port elements. The theory is built around energy with four energy-based postulates and the two laws of energy conservation and dissipation. The theory leans heavily on analytical methods developed for the treatment of lumped parameter circuits and systems. The application of basic theory is discussed, starting with calories and eventually involving the coupling of thermal to mechanical, electrical, and magnetic energies. The concept of quasi-static processes in energy conversion statics is extended to dynamic time dependent processes in general nonconservative systems. G.R.

A70-27758 Pulsed power fuel cells. R. A. Sanderson, C. L. Bushnell, and T. F. McKiernan (United Aircraft Corp., Pratt and Whitney Aircraft Div., East Hartford, Conn.). In: Fuel cell systems - II; American Chemical Society, Meeting, 154th, Biennial Fuel Cell Symposium, 5th, Chicago, Ill., September 12-14, 1967, Proceedings. (A70-27757 12-03) Washington, D.C., American Chemical Society (Advances in Chemistry Series, No. 90), 1969, p. 60-69.

Fuel cells operating at high current density under pulsed loading were investigated. Trapped electrolyte cells with catalyzed screen electrodes operating at 160-220 F and free electrolyte cells with dual pore electrodes operating at 400-450 F were tested. Cells were subjected to a single switch closure with low circuit resistance. Current densities up to 15,600 A/sq ft and power densities up to 6240 W/sq ft were recorded. Cell capacitance calculated from response traces was 200-700 farads/sq ft. Tests were also conducted in which the cells were subjected to continuous square wave pulse loading at pulse frequencies of 10-10,000 Hz, pulse durations of 20-95% and pulse amplitudes up to 3600 A/sq ft. Power density at equal cell voltage was found to improve under pulsed loading.

(Author)

A70-28654 Mechanical electromagnet as an MHD dynamo. I. M. Kirko (Latviiskii Gosudarstvennyi Universitet, Riga, Latvian SSR). (Akademii Nauk SSSR, Doklady, vol. 188, Sept. 11, 1969, p. 330-333.) Soviet Physics - Doklady, vol. 14, Mar. 1970, p. 921-923. 10 refs. Translation.

Study of the use of a mechanical electromagnet as a device for achieving direct conversion of mechanical energy into magnetic field energy. The system considered involves an infinite number of conducting layers moving in a magnetic field, with electrical contacts being inserted between the layers so as to produce an electric current generator. The method of confining the magnetic field consists in compensating for the decay of the magnetic field in the conducting medium by a directed motion of the medium, where the magnetic lines of force assume a spiral shape, thus replenishing the magnetic field.

(Author)

A70-29492 * # Technology for nuclear dynamic space power systems. Robert E. English (NASA, Lewis Research Center, Cleveland, Ohio). American Nuclear Society, Conference on Aerospace Nuclear Applications, Huntsville, Ala., Apr. 28-30, 1970, Paper. 19 p. 10 refs.

Discussion of the Brayton, mercury, organic-Rankine, and potassium-Rankine dynamic space power systems for use with nuclear energy sources. The state of development of these systems is described, and their salient characteristics are discussed. For the advanced systems, the supporting technology is briefly reviewed. The power outputs of these systems range from a few kilowatts to perhaps a few megawatts. These systems are comparatively efficient and have reasonable radiator area needs. A considerable amount of technology on these systems has been accumulated for the ultimate realization of these advantages. M.V.E.

A70-30100 * Fuel cells: Their electrochemistry. J. O'M. Bockris (Pennsylvania, University, Philadelphia, Pa.) and S. Srinivasan (New York, State University, Buffalo, N.Y.). Research supported by NASA; Grant No. NSG-325. New York, McGraw-Hill Book Co., 1969. 680 p. 514 refs. \$20.

The text offered attempts to define and explain the basis of the functioning of fuel cells and the reactions at the electrodes, as well as to provide a basis for the direction of future research. Knowledge of other basic disciplines, in particular hydrodynamics and materials science, is also necessary for the worker concerned with fuel cells. The writing of this book was influenced by the absence of education in electrochemistry in high schools and universities. Direct energy conversion methods and the advantages of the electrochemical method are first discussed, followed by study of basic electrode kinetics. Thermodynamic aspects of electrochemical energy conversion are considered, and some electrode kinetic aspects of electrochemical energy conversion are examined. The kinetics of electrode reactions in porous media are treated, followed by an extensive study of electrocatalysis. Attention is given to electrochemical combustion of organic substances and to electrocatalytic reactions of oxygen. Fuel-cell research techniques are outlined, and types of fuel cells are described. F.R.L.

A70-30531 * Effect of slots on MHD induction generator efficiency. D. G. Elliott (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). (Symposium on Engineering Aspects of Magnetohydrodynamics, 10th, Cambridge, Mass., Mar. 26-28, 1969.) Energy Conversion, vol. 10, Apr. 1970, p. 73, 74.

Investigation of the effect of finite spacing and finite width of the winding slots on the efficiency of an MHD induction generator. The reduction in efficiency due to these factors is calculated by summing the effects of the resulting harmonics. For a 300 kW lithium generator, the efficiency is reduced by 30, 10, and 3% with 6, 12, and 24 slots (3, 6, and 12 phases), respectively. T.M.

A70-30534 The effect of air/fuel level in the MHD generator on the operation of an open-cycle MHD-topped power plant. H. F. Feldmann, D. Bienstock (U.S. Bureau of Mines, Coal Research Center, Pittsburgh, Pa.), and W. H. Simons (West Virginia, University, Morgantown, W. Va.). Energy Conversion, vol. 10, Apr. 1970, p. 89-91. 9 refs.

Comparison of the operation of an MHD generator at below stoichiometric air/fuel ratios to the operation at a 5% excess air level. At below stoichiometric ratios, combustion is completed by injecting additional air downstream of the MHD generator. Major advantages of operating at below stoichiometric ratios include increased power densities and reduced air preheating temperatures without loss of the overall thermal efficiency of the plant. T.M.

A70-30535 Replenishment of electrodes for MHD power generation. A. C. Warren and P. G. Meier (Central Electricity Generating Board, Research Laboratories, Leatherhead, Surrey, England). Energy Conversion, vol. 10, Apr. 1970, p. 93-97. 9 refs.

Investigation of the replenishment of MHD zirconia electrodes directly from a plasma in both open-flame and duct configurations. The zirconia deposited only on the electrodes, and the rate of deposition was a function of injected zirconia particle size and distance along the duct. The results may be adequately explained if it

is assumed that the deposition occurs by molecules subliming from the injected particles and condensing on the electrodes. The data are inconsistent with the view that the particles are deposited directly.

T.M.

A70-30536 EGD energy converter geometry studies. D. M. France and G. J. Trezek (California, University, Berkeley, Calif.). *Energy Conversion*, vol. 10, Apr. 1970, p. 99-104. 6 refs. Research supported by the Chancellor's Patent Fund.

Investigation of system geometries of the electrogas-dynamic (EGD) energy converter to obtain maximum power efficiencies for the conversion process. A comparison of three slender EGD conversion channels, abrupt expansion, free jet, and divergent, is made with respect to the operating characteristics, current ratio, voltage amplification ratio, and electrical power efficiency. The effect of the channel length parameter of the abrupt expansion and free jet channels on the operating characteristics over a range of load resistance up to 10 to the 11th power ohms is then examined. The results as they relate to the electrical power efficiency indicate a correlation between channel length and load resistance for peak efficiency.

O.H.

A70-33474 The potential of magnetohydrodynamic power sources for airborne applications. David R. Morgan, Ira H. Bowker, and Jacob A. Adams (USAF, Aeronautical Systems Div., Wright-Patterson AFB, Ohio). In: NAECON '70; Institute of Electrical and Electronics Engineers, National Aerospace Electronics Conference, Dayton, Ohio, May 18-20, 1970, Proceedings. Dayton, Ohio, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 335-341.

The potential of magnetohydrodynamic power sources for application to future electrical needs on-board military aircraft was recently investigated. Of primary interest was the identification of future airborne applications which could effectively employ this advancing technology. The study effort was organized around the detailed examination of seven specific potential applications, each of which appeared to exploit one or more of the recognized characteristic features of MHD power sources. These seven applications represented a broad spectrum of power levels, operating durations and flight altitudes. Technological projections for both MHD and alternator units were used to assess these competing power sources relative to the requirements of each specific application. The prospects for general airborne applicability was thus established. This detailed analysis was utilized to draw certain useful conclusions and to establish some general observations in regard to the future role of airborne MHD-type electrical generators.

(Author)

A70-38481 Cadmium telluride photocells (Photopiles au tellurure de cadmium). G. Coste (Centre National d'Etudes Spatiales, Direction des Programmes et du Plan, Paris, France) and J. Lebrun (Compelec, Paris, France). *AFEDES, Cahiers*, no. 2, Jan. 1970, p. 80-85. In French.

Study of cadmium telluride photocells, with outline of their history and general discussion of the photovoltaic effect. Attention is given to current technology in the field, actual performance, and manufacture. It is considered that an overall efficiency of 5 percent could be obtained from mass production photocells, which could be constructed in large sizes at a moderate price.

F.R.L.

A70-39225 # Thermoelectric devices - For space and remote terrestrial sites. Glen Whiting and John McKiernan (Sandia Corp., Albuquerque, N. Mex.). *Mechanical Engineering*, vol. 92, Aug. 1970, p. 27-31.

Description of the design of thermoelectric generators and problems connected with their development. The significances of the Seebeck coefficient and effects of Peltier and Thomson are explained. The principles of fossil-fueled thermoelectric generators, as well as those using radioisotopes and reactors as the heat source, are briefly described. The problems connected with development of

thermoelectric generators are discussed taking into consideration generator section - i.e., fuel source, conversion section, container, heat rejection, and others. The importance of thermal bypass losses for the generator performance is examined.

Z.W.

A70-39325 Survey of liquid metal magnetohydrodynamic energy conversion cycles. Frederick H. Morse (Maryland, University, College Park, Md.). *Energy Conversion*, vol. 10, July 1970, p. 155-176. 38 refs.

Description and comparison of the proposed liquid-metal MHD cycles with a summary of the present state of their development. A brief report of the evolution and status of liquid-metal MHD power generation systems is presented. The maximum predicted efficiencies for the four basic liquid-metal MHD cycles and all modifications included in this review are tabulated. The maximum cycle temperature ranged from 1120 to 1500 K, with a mean value of 1370 K. The minimum cycle temperature ranged from 700 to 1090 K, with a mean value of 920 K, and the generator was assumed to have an efficiency of 70%.

Z.W.

A70-39636 # Effect of certain factors on the external characteristics and efficiency of MHD generators (Vliianie nekotorykh faktorov na vneshnii kharakteristiki i effektivnost' MGD-generatorov). A. V. Gubarev and V. A. Gurashvili. *Teplofizika Vysokikh Temperatur*, vol. 8, May-June 1970, p. 634-640. 8 refs. In Russian.

Examination of the effect of unidimensional plasma inhomogeneities on the characteristics of MHD generators. Following problems are analyzed: (1) current-voltage characteristics of MHD generators, (2) effect of the inhomogeneities on the efficiency of an MHD generator, (3) optimum geometrical dimensions of the MHD duct, and (4) efficiency of the energy conversion in MHD systems.

Z.W.

A70-39986 * # A progress report on the JPL liquid-metal MHD cycle. D. J. Cerini and L. G. Hays (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Massachusetts Institute of Technology, Symposium on Engineering Aspects of Magnetohydrodynamics, 10th, Cambridge, Mass., March 26-28, 1969, Proceedings. Edited by W. D. Jackson and J. E. Klepeis. Everett, Mass., Avco Research Laboratory, 1969, p. 36-38.

Progress in developing a liquid-metal MHD power conversion system is summarized. This system employs cesium and lithium as working fluids at peak temperatures to 1100 deg C. The initial, simplified test system uses NaK and nitrogen at ambient temperature to obtain hydraulic and electrical characteristics for the full size components. Hydraulic and empty-channel electrical tests have been completed for this system. Another test system under construction is a smaller, high temperature (1100 deg C) cesium-lithium loop which is designed to obtain nozzle performance and evaluate the erosion resistance of separator materials. All of the refractory metal components are fabricated and hydraulic evaluation of the nozzle and separator has been concluded. A high power cesium-lithium conversion system, which will operate at 1000 deg C, is being designed. High temperature heat transfer and materials tests to support this effort were completed. Improvements in the cycle efficiency by extracting the power in several stages were calculated and values in the 10% range at 500 kWe appear feasible.

(Author)

A70-39988 # Experimental study of a one-wavelength MHD induction generator. E. S. Pierson (Illinois, University, Chicago, Ill.) and W. D. Jackson (Avco Everett Research Laboratory, Everett, Mass.). In: Massachusetts Institute of Technology, Symposium on Engineering Aspects of Magnetohydrodynamics, 10th, Cambridge, Mass., March 26-28, 1969, Proceedings. Edited by W. D. Jackson and J. E. Klepeis. Everett, Mass., Avco Research Laboratory, 1969, p. 53-57. 8 refs. Contract No. AF 33(615)-67-C-1375.

05 ENERGY CONVERSION

Discussion of the design and construction of an experimental MHD induction generator in which electrical and friction losses are readily measured and varied. The design philosophy and constraints are briefly summarized as they define the form of the experimental generator. The basic objective is to perform a careful, controlled experiment where the various loss mechanisms can be studied in detail, so that the design is chosen to allow a maximum amount of flexibility. Particular attention is paid to the region of small slip where small but significant discrepancies have shown up in previous experiments. A number of methods have been proposed to minimize the end losses, but no complete experimental comparison has ever been performed. This generator can be operated without iron overhang, with iron overhang, or with compensating poles; and all three cases can be tested with or without vanes and grading of the exciting winding. The resulting generator design is described for the fluid channel, traveling field structure, and compensating poles. Then the preliminary experimental results with an empty fluid channel are described, with emphasis on the traveling magnetic field. The effect of various arrangements on the smoothness of the traveling field is shown, and it is demonstrated that with proper care an acceptably smooth field is obtained (both in magnitude and phase). M.V.E.

A70-39991 # Preionization in nonequilibrium plasmas. Norman A. Evans (GE Space Sciences Laboratory, King of Prussia, Pa.). In: *Massachusetts Institute of Technology, Symposium on Engineering Aspects of Magnetohydrodynamics*, 10th, Cambridge, Mass., March 26-28, 1969, Proceedings. Edited by W. D. Jackson and J. E. Klepeis. Everett, Mass., Avco Research Laboratory, 1969, p. 100-104. Contract No. AF 44(620)-68-C-0048.

An experimental study of the preionization process in nonequilibrium plasmas has been started in a cesium-seeded argon mixture. The work is being performed in a boron nitride channel containing twelve electrode pairs, each equipped with a discharge holder at a gas stagnation temperature of 1500 deg K, Mach numbers up to $M = 0.6$ and a transverse magnetic field strength up to $B = 22,500$ gauss. For discharge currents of three amps the results show that steady, stable behavior is obtained up to $M = 0.6$ for $B = 0$, with the discharge holders fully effective in controlling the current path. However, for B greater than 0, discontinuous increases in electrode voltage have been observed, and on the basis of probe readings it was concluded that the first discharge had jumped to the next adjacent holder downstream. Depending on M and B , up to four of these events have been observed and there were strong hysteresis effects on decreasing M or B . Other results show that the presence of a magnetic field causes a significant increase in the power required to establish a given conductivity as well as substantially increasing the recombination rates. In addition, there is apparently a certain preionizing discharge array to achieve a final quasi-constant conductivity at minimum power input. Finally good agreement with theory has been found for the dependence of the final highly nonequilibrium conductivity on the magnetic field and the channel electrode geometry. (Author)

A70-40001 * Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi University, 1970. 221 p. \$10.00.

Contents:
Combustion generators.

Some observations of the aerodynamics of a large MHD generator channel. W. Luchuk (ARO, Inc., Arnold Air Force Station, Tenn.), p. 3, 4.

Comparison of experimental and analytical results for a 20-MW combustion-driven Hall configuration MHD generator. O. K. Sonju, J. Teno (Avco Everett Research Laboratory, Everett, Mass.), and T. R. Brogan, p. 5-10. 15 refs.

The performance of a family of diagonal conducting wall MHD open cycle generators. J. B. Dicks, Y. C. L. Wu, L. W. Crawford, J. K.

Koester, J. W. Muehlhauser, L. Edwards, P. Chang, and J. W. Stephens (Tennessee, University, Tullahoma, Tenn.), p. 16-28. 6 refs.

Electrode size effects in combustion-driven MHD generators. E. S. Rubin and R. H. Eustis (Stanford University, Stanford, Calif.), p. 35-40.

Plasmas and discharges.

A high pressure potassium vapor diode study. N. A. Evans (GE Space Sciences Laboratory, King of Prussia, Pa.), p. 49-53. 11 refs.

Analytical and experimental studies of thermionically emitting electrodes in contact with dense, seeded plasmas. J. K. Koester (Tennessee, University, Tullahoma, Tenn.), M. Sajben, and E. E. Zukoski (California Institute of Technology, Pasadena, Calif.), p. 54-60. 10 refs.

Influence of controlled turbulence on gaseous discharges. S. T. Demetriades, C. D. Maxwell, G. S. Argyropoulos, and G. Fonda-Bonardi (STD Research Corp., Pasadena, Calif.), p. 64-69. 7 refs.

Investigation of the behavior of the discharge and the flow in a homopolar device. H. O. Noeske (General Electric Co., Philadelphia, Pa.), p. 71-74.

Design and operational characteristics of the Langley 20-megawatt plasma accelerator facility. W. R. Weaver, D. R. McFarland, A. F. Carter, and G. P. Wood (NASA, Langley Research Center, Hampton, Va.), p. 77-81. 7 refs.

Closed cycle generators and generator design.

Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator. R. J. Sovie and L. D. Nichols (NASA, Lewis Research Center, Cleveland, Ohio), p. 82-89. 6 refs.

Performance of a large scale, non-equilibrium MHD generator with rare gases. H. B. Zauderer and E. Tate (GE Space Sciences Laboratory, Philadelphia, Pa.), p. 95-100. 7 refs.

Current distribution in conducting wall MHD generators. R. H. Eustis, R. M. Cima, and K. E. Berry (Stanford University, Stanford, Calif.), p. 119-127. 10 refs.

Liquid-metal magnetohydrodynamics.

Liquid-gas separation using impinging two-phase jets. D. Bogdanoff (California Institute of Technology, Pasadena, Calif.), p. 149-153.

Preliminary experimental results from a one-wavelength MHD induction generator. E. S. Pierson (Illinois, University, Chicago, Ill.), p. 161-164.

A nuclear electric propelled spacecraft using a 300 KWe liquid metal magnetohydrodynamic power system. R. M. Bernero, A. S. Jacobsen (General Electric Co., King of Prussia, Pa.), and N. A. Evans (Pennsylvania, University, Philadelphia, Pa.), p. 165-169. 5 refs.

Channel flows and instabilities.

Compressible turbulent boundary layers with MHD effects, electron thermal nonequilibrium, and finite rate ionization. E. J. Felderman and M. D. High (ARO, Inc., Arnold Air Force Station, Tenn.), p. 180-183.

Ionization instabilities in a continuous-electrode generator. R. M. Evans, J. F. Louis, M. Mitchner, and C. H. Kruger (Stanford University, Stanford, Calif.), p. 190-192.

Electrothermal instability in plasmas with current flow parallel to the magnetic field. A. Solbes, T. Nakamura, and J. L. Kerrebrock (MIT, Cambridge, Mass.), p. 209-215. 6 refs.

A70-40003 # Comparison of experimental and analytical results for a 20-MW combustion-driven Hall configuration MHD generator. O. K. Sonju, J. Teno (Avco Everett Research Laboratory, Everett, Mass.), and T. R. Brogan. In: *Jet Propulsion Laboratory*,

Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 5-10. 15 refs.

Results of a continuing effort to upgrade 'design' and 'off-design' analytical techniques for MHD generators. The analytical techniques are applicable to all types of generators, but the work is primarily concerned with the analysis of Hall MHD generators. The techniques used in the analysis, including boundary layer analysis, gas nonuniformity considerations, and electrode drop effects are reviewed. Comparisons between predicted and observed operating characteristics of a previously described 20 MW Hall generator are discussed. Although there are some small discrepancies, the correlation between predicted and observed performance is very good. The analysis is shown to predict the stalling point accurately. F.R.L.

A70-40004 # The performance of a family of diagonal conducting wall MHD open cycle generators. J. B. Dicks, Y. C. L. Wu, L. W. Crawford, J. K. Koester, J. W. Muehlhauser, L. Edwards, P. Chang, and J. W. Stephens (Tennessee, University, Tullahoma, Tenn.). In: Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 16-28. 6 refs. Contract No. AF 44(620)-69-C-0031.

Experimental and theoretical studies have been made of the performance of a 45 deg diagonal conducting wall generator and a Hall generator of the same physical dimensions. The wall temperature effect is investigated and an arc model is proposed. Aluminum was successfully burned in the combustor. It was found that the coating from burning of aluminum improves the channel performance due to the heating up of the walls. It was found that the fluctuations present in the Hall channel have much higher frequencies than those in the 45 deg DCW channel. The fluctuations grow along the channel in the Hall mode. The presence of the aluminum attenuates the fluctuations. The effect of the low conductivity nonuniformities in the plasma and the coating of the wall has a very profound effect on the performance of the Hall generator. (Author)

A70-40005 # Electrode size effects in combustion-driven MHD generators. E. S. Rubin and R. H. Eustis (Stanford University, Stanford, Calif.). In: Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 35-40. 7 refs. Contracts No. AF 33(615)-67-C-1127; No. AF 33(615)-69-C-1171.

Comparison of the data from an investigation of effects of electrode size on the performance of a combustion-driven MHD generator with an analytical model of the boundary layer. For the segmented-Faraday mode, an influence of electrode size on generator performance exists which is manifested by lower voltage losses at a larger electrode for similar conditions of surface and gas boundary layer temperature. Decreasing electrode temperature worsens electrode performance, but a larger electrode size continues to have lower losses for a given temperature of the gas boundary layer. For dissimilar boundary layer temperatures, a marked change may occur in the relative performance of different electrode sizes at the same surface temperature. Voltage losses at a sufficiently hot anode reflect an essentially gasdynamic dependence on electrode size and temperature, and are reasonably well predicted by a two-dimensional analytical model incorporating a variable electrical conductivity in the boundary layers. F.R.L.

A70-40011 * # Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator. R. J. Sovie and L. D. Nichols (NASA, Lewis Research Center, Cleveland, Ohio). In: Jet Propulsion

Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 82-89. 6 refs.

The NASA-Lewis closed loop MHD generator was designed to study power generation with nonequilibrium ionization using a cesium seeded argon plasma. The results of the first five tests, in which the general design and structural integrity of the loop were studied, have been reported on in a previous paper. This facility has been run subsonically seven times in the past year. These tests evaluated various loop subsystems necessary to supply the proper plasma conditions, such that the basic concepts of low temperature (approximately 2100 deg K) MHD power generation can be studied. These subsystems include an impurity purge system, a new vapor cesium injection system, a multiple electrode sidewall pre-ionizer system and various starter electrode systems. The necessity of these systems and their performance characteristics are presented. The initial generator data obtained after incorporating these components into the facility are also presented and discussed. (Author)

A70-40012 # Performance of a large scale, non-equilibrium MHD generator with rare gases. H. B. Zauderer and E. Tate (GE Space Sciences Laboratory, Philadelphia, Pa.). In: Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 95-100. 7 refs. Navy-supported research.

Results of the conclusion of an experimental study of the operating characteristics of a large, shock tunnel driven, linear MHD generator with noble gas mixtures. The experiments were performed in a Penning mixture consisting of 99% neon and 1% xenon. The electron density, $n_{sub e}$, was measured at four locations along the generator axis. With $n_{sub e}$ and the electrical measurements, a complete description of the electrical operating characteristics of the generator was obtained. A significant result is that the electrical and plasma properties of this generator were about the same as in a smaller shock tube driven generator having 2% of the volume of the present generator. Thus, the present results can be reasonably expected to apply to considerably larger MHD channels. F.R.L.

A70-40013 # Current distribution in conducting wall MHD generators. R. H. Eustis, R. M. Cima, and K. E. Berry (Stanford University, Stanford, Calif.). In: Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 119-127. 10 refs. Contract No. AF 33(615)-69-C-1171.

Experiments were conducted in an MHD channel which measured the current distribution to electrodes and conducting sidewalls. It was found that anode current distributions could be predicted by a computer program with satisfactory accuracy but that cathode predictions were unsatisfactory. (Author)

A70-40015 * # Preliminary experimental results from a one-wavelength MHD induction generator. E. S. Pierson (Illinois, University, Chicago, Ill.). In: Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings. Edited by D. G. Elliott. University, Miss., Mississippi, University, 1970, p. 161-164. Contracts No. JPL-952453; No. AF 33(615)-67-C-1375.

Preliminary results from an experimental one-wavelength MHD induction generator and test facility are described. The zero-field pressure gradients were up to three times the theoretical values. The measurements indicate that this is probably due to gas entrained in

the liquid. The pressure gradients were reduced by adding more NaK to the storage tank. The results from 37 data points covering fluid velocities from 21.8 to 78.0 ft/sec are summarized. Only operation without compensating poles or insulating vanes is covered, including both normal excitation and excitation with the end coils shorted. Net electrical output power was obtained for these cases, but the efficiency was low. This data also supports the hypothesis of two-phase flow in the generator. (Author)

A70-40257 # One-dimensional particulate electrogas-dynamics. George J. Trezek and David M. France (California, University, Berkeley, Calif.). *AIAA Journal*, vol. 8, Aug. 1970, p. 1386-1391. 9 refs.

Theoretical analysis of a two-phase particulate electrogas-dynamic flow. The effect of the space charge induced electric field force on the solid particle charge carrier is included. The direct mental conditions and their relation to the critical velocity hypothesis. Therefore the evidence for critical velocity is reviewed and discussed with reference to MPD arcs. No basis is found for relating MPD arc exhaust velocity a priori to critical velocity. A one-dimensional flow model of the self-field MPD arc is presented, and a relation is found to exist between exhaust velocity and E/B. In order to relate the exhaust velocity to critical velocity, a detailed analysis of the current sheet structure is necessary. (Author)

A70-42071 Electrodynamic generator with neutralization of the space charge. A. M. Borok (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Tokov Vysokoi Chastoty, USSR). (*Teplofizika Vysokikh Temperatur*, vol. 8, Jan.-Feb. 1970, p. 177-181.) *High Temperature*, vol. 8, Jan.-Feb. 1970, p. 166-170. 6 refs. Translation.

Development of a theoretical basis for constructing a high capacity electrodynamic generator performing direct thermal-to-electrical energy conversion. The operation of such a generator at high gas pressures is analyzed. Engineering formulas for generator designs, with specifications for a generator operating at 200 atm and a generator using an aerosol, are given. It is concluded that the specific capacity of these designs may exceed 3000 kW/cu m, providing a high efficiency at relatively low temperatures. V.Z.

A70-42499 Optimization of high-temperature fuel cells of a flat-type design (Optimierung von Hochtemperatur-Brennstoffzellen in Flachzellen-Bauweise). Hans-Joachim Böhme (Brown, Boveri et Cie. AG, Heidelberg, West Germany). *Raumfahrtforschung*, vol. 14, July-Aug. 1970, p. 154-156. In German.

Optimization study of the design of high-temperature fuel cells with thin disk solid electrolytes. The performance of the cell as a function of disk diameter is investigated taking into account various electrolyte resistivities. An example showing the use of the information presented in the design of a fuel cell with optimum performance is given. G.R.

A70-43361 # Optimization of the tuning of gas turbine engines (Optimizatsiia otladki gazoturbinnnykh dvigatelei). Iu. V. Kozhevnikov and R. I. Adgamon. *Aviatsionnaia Tekhnika*, vol. 13, no. 2, 1970, p. 73-80. In Russian.

Consideration of the problem of adjusting the rpm, the thrust, the fuel flow rate per second, and the gas temperature in the characteristic cross section of a two-stage gas turbine engine. A general method of achieving this adjustment is proposed, as well as a simplified method which can be used in many particular cases of practical importance. The preparation of the initial data for optimal tuning of gas turbine engines during automated bench tests using computers is described. A.B.K.

A70-43539 # Low-power-consumption auxiliaries for fuel-cell power systems. J. K. Johnson (Shell Research, Ltd., Chester, England). *Joint Services Electrical Power Sources Committee, Inter-*

national Power Sources Symposium, 7th, Brighton, England, Sept. 15-17, 1970, Paper 21, 22 p.

An auxiliary system for a hydrazine-fuelled fuel battery is described in which all the power required by the auxiliaries is drawn for the battery. The external load is constant. Considerations of power economy have led to the use of two gas pumps. One pump generates the pressure difference required across the air electrode while a second pump generates the flow of reactant air against only the flow impedance of the path. The distribution of electrical and mechanical power is given in some detail. The effect, on the design of the auxiliary system, of accommodating changes of external load has also been considered and has led to the introduction of a voltage controller for the auxiliary system. This increases the flow of the auxiliary streams as the demand for load current increases, which is when the fuel battery voltage decreases. (Author)

A70-43541 # Construction and operation of a hydrazine-oxygen fuel cell module. H. Kohlmeier, H. Knobloch, and F. v. Sturm (Siemens AG, Forschungslaboratorium, Erlangen, West Germany). *Joint Services Electrical Power Sources Committee, International Power Sources Symposium, 7th, Brighton, England, Sept. 15-17, 1970, Paper 20, 17 p.* 26 refs. Research supported by the Bundesministerium der Verteidigung.

Description of the construction of a hydrazine fuel cell module using cells with nickel screen anodes and supported oxygen cathodes with silver powder as catalyst. Special importance had to be attached to the design of the electrolyte space, since hydrazine is subject to many harmful secondary reactions. Equations for optimum operation were derived and a Faradaic efficiency of 90% was achieved with a ten-cell battery. The injection of the hydrazine fuel into the circulating electrolyte was controlled by a new hydrazine sensor or by the battery voltage. A catalytic H₂O₂ decomposer was used for supplying the oxygen. M.M.

A70-44900 # Optimum number of the load circuits in the Hall-type MHD-generator. Z. Celiński (Polska Akademia Nauk, Instytut Badań Jądrowych, Warsaw, Poland). *Archiwum Elektrotechniki*, vol. 19, no. 3, 1970, p. 413-422.

Analysis of the optimal load circuit configuration for maximum power extraction from a Hall MHD generator with gas parameters varying strongly along the channel. It is shown that maximum power can be drawn from the generator when its electrodes are connected in a multiterminal mode with n separate load circuits and a specific configuration of terminals. The influence of end effects is taken into account together with the complexity of operation with a large number of load circuits. Results of calculations are given for the case of a relatively large change in gas conductivity between the inlet and outlet of the channel. T.M.

A70-45956 # Exploring a closed Brayton cycle MHD power system applying NERVA reactor technology. R. R. Holman and S. Way (Westinghouse Electric Corp., Pittsburgh, Pa.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 7th, Houston, Tex., Oct. 19-22, 1970, Paper 70-1225, 8 p.* 17 refs. Members, \$1.50; nonmembers, \$2.00.

Study of the NERVA reactor, which makes possible temperatures in closed MHD power cycles up to 2500 K. With such temperatures exceptionally good system efficiencies are realized. Also, thermal equilibrium ionization in a gas such as cesium seeded helium is attractively high. For space applications, a high radiator temperature can be used, leading to low area - e.g., 1 sq ft/kw(e). For terrestrial applications a recuperator would be used. Efficiencies around 50% without bottom plant and 60% with bottom plant would be anticipated. There are two development areas: (1) insurance against cesium damage in the reactor, (2) effective fission product retention. Outlook is promising with extended present technology. (Author)

A70-48399 Batteries and fuel cells. M. Barak. *IEE Reviews*, vol. 117, Aug. 1970, p. 1561-1584. 48 refs.

Review of the progress achieved to date in the field of designing portable and transportable power sources. The basic principles of electrochemical power sources are outlined, and the manufacturing processes and performance of the main types are briefly described. Some details are given of new cell types capable of much higher outputs than conventional batteries - in particular, sodium-sulphur, lithium-chlorine, and zinc-air cells. Fuel cells are described in some detail and indications are given of outstanding problems. Finally, the characteristics of the various power sources are summarized, and the relationships between the power and energy densities are illustrated graphically. O.H.

A71-11192 Fuel cells: Modern processes for the electrochemical productions of energy. Wolf Vielstich (Bonn, Universität, Bonn, West Germany). Research supported by the Arbeitsgemeinschaft für Industrielle Forschung, the Bundesverkehrsministerium, the Deutsche Forschungsgemeinschaft, the Fraunhofer Gesellschaft zur Förderung der Angewandten Forschung, and the Verband der Chemischen Industrie. (Translation of Brennstoffelemente: Moderne Verfahren zur Elektrochemischen Energiegewinnung, Weinheim, West Germany, Verlag Chemie GmbH, 1965.) London and New York, Wiley-Interscience, 1970. 519 p. 877 refs. \$25.

An attempt is made to present a comprehensive but concise account of research and development in the field of the direct generation of electrical energy by electrochemical processes, to the stage achieved in 1964. The results of extensive hitherto unpublished research are included. In introductory chapters, ideas, terminology, and basic physicochemical principles of electrochemical energy conversion are summarized. Special attention is given to the kinetics of electrode processes from a technological point of view. The recent original work of numerous electrode reactions is reported. The physicochemical and technological problems involved in the construction and operation of complete cells are described. The most promising electrochemical methods for electrochemical conversion of heat and nuclear energy into electrical energy are described. The electrochemical methods for storing electric energy are examined together with the separation of the isotopes of hydrogen accompanying the electrolysis of aqueous solutions. In conclusion, the whole field is briefly reviewed and possibilities of future applications of the new sources of energy are discussed. The book is intended not only for electrochemists but for all groups of research workers interested in energy conversion. Z.W.

A71-11183 Direct energy conversion. M. A. Kettani (Pittsburgh, University, Pittsburgh, Pa.). Reading, Mass., Addison-Wesley Publishing Co., Inc., 1970. 465 p. 1376 refs. \$14.95.

The general aspects of energy conversion are briefly reviewed. Physical principles are then discussed in terms of thermodynamics, quantum mechanics, solid state, and plasma physics. Nine separate methods of converting energy directly are treated in detail. They include fusion power, magnetohydrodynamic, thermoelectric, and thermionic power generation, fuel cells, and electrohydrodynamic, piezoelectric, and ferroelectric power generation. Moreover, more than fifteen additional methods of converting energy directly into electricity are described in less detail. O.H.

A71-12195 # Influence of leakages on MHD generator characteristics (K voprosu o vlianii utechek na kharakteristiki MGD-generatora). V. A. Biturin (Akademii Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 8, July-Aug. 1970, p. 885-889. 6 refs. In Russian.

Investigation of the influence of transverse current leakage in an MHD generator channel on the basic energy conversion characteristics in the presence of a Hall effect. Attention is given to the local shunting case where leakage currents to the wall bypass the electrode and the poorly conducting flow region near its surface. It is shown

that the electrical parameters of the flow in this case can differ substantially from the corresponding values calculated on the basis of the widely used shunting model involving a concentrated loss resistance connected parallel to the load resistance. T.M.

A71-13704 # Electrofluid dynamic energy conversion - Present status and research areas. Maurice Lawson and Hans von Ohain (USAF, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio). American Society of Mechanical Engineers, Paper no. 70-Ener-A, 1970. 20 p. 70 refs. Members, \$1.00; nonmembers, \$2.00.

This paper presents in depth the major basic performance characteristics of electrofluid dynamic (EFD) energy conversion processes, which are shown to be complementary to magnetofluid dynamic processes. With a view toward making possible effective thermal electric energy conversion without moving parts, the potential compatibility of incorporating low pressure ratio EFD processes into high pressure ratio thermodynamic cycles is shown. Investigations of scaling, similarity, performance characteristics, and the effects of physical properties of working media containing electric charges of one polarity are used as a basis to determine the major problems and corresponding research areas in EFD energy conversion. In general these are: generation of charged colloids; electrode and conversion duct geometry; and fluid dynamic energy transfer phenomena in multicomponent, multiphase flows. Also given are typical configurations of EFD energy converters, and a look at potential applications, especially those associated with encapsulated, long-duration power supply for operations in space, under the ocean, or at remote unattended sites. (Author)

A71-14321 Optimizing hydrazine-oxygen fuel cells. H. Kohlmüller (Siemens AG, Forschungslaboratorien, Erlangen, West Germany). *Energy Conversion*, vol. 10, Nov. 1970, p. 201-205. 5 refs. Research supported by the Bundesministerium der Verteidigung.

Consideration of a hydrogen-oxygen fuel cell which has a hydrazine electrode with an active two-phase boundary. This electrode has one or more meshes which are covered with a catalyst which consists of nonnoble metals or their compounds, such as Ni₂B, Co₂B, or Raney nickel either used alone or as a base for other noble metals (Pd-Ru). The cell also has a supported oxygen electrode. The powder catalyst may consist of Raney silver or carbon with silver. The cover layer of this electrode serves simultaneously as the diaphragm. It must consist of electronically nonconductive material; asbestos is mostly used. F.R.L.

A71-16785 # Some problems related to the conversion of chemical energy into mechanical work (Nekotorye voprosy preobrazovaniia khimicheskoi energii v mekhanicheskuiu rabotu). I. M. Kovtun, A. N. Naumov, and S. L. Kosmatov (Vsesoiuznyi Nauchnyi Politehnicheskii Institut, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 8, Sept.-Oct. 1970, p. 1056-1063. In Russian.

Theoretical study of the production of work from a chemical reaction resulting from the irreversible mixing of reacting materials without separation of the products of the reaction. Conditions for the production of work during a chemical reaction in a Vant Hoff box are studied when the temperature of expansion is higher than that of contraction. It is shown theoretically that work can be obtained from a chemical reaction conducted without changes in volume in a Vant Hoff box without semipermeable partitions. It is also found that reactions involving no changes in the numbers of moles are necessary for a conversion of chemical-into-mechanical energy in the absence of semipermeable partitions with efficiencies higher than that of a Carnot cycle. V.Z.

A71-20000 The prospects of fusion power. William C. Gough and Bernard J. Eastlund (U.S. Atomic Energy Commission, Washington, D.C.). *Scientific American*, vol. 224, Feb. 1971, p. 50-64.

05 ENERGY CONVERSION

The present state of development of fusion-energy technology is discussed, and remaining problems which have to be solved for the construction and operation of a power-producing controlled-fusion reactor are considered. Various approaches for supplying the needed energy in the future are briefly examined, and an account of research conducted to develop controlled means of releasing fusion energy is given. Fusion reactions regarded as potentially useful in full-scale fusion reactors are considered, and the temperatures and densities obtained in plasma experiments are shown. A survey of the principal schemes devised to confine plasmas is presented. Fusion-reactor designs are discussed, and basic criteria for achieving conditions to operate a fusion reactor are investigated. Environmental advantages of fusion power are examined, and estimates regarding the timetable to fusion power are considered. G.R.

A71-22136 # Selection of optimum conditions at the inlet of an MHD-generator channel (Vybor optimal'nykh uslovii na vkhode v kanal MGD-generatora). K. V. Donskoi, Iu. A. Dunaev, E. V. Nazarov, and I. I. Shakhnov. *Magnitnaia Gidrodinamika*, vol. 6, Oct-Dec. 1970, p. 101-105. 8 refs. In Russian.

Analysis of the optimal inlet parameters for an MHD channel employing combustion products of kerosene and gaseous oxygen. The analysis is performed for an ideally sectioned channel and for a channel with solid electrodes of finite length. It is shown that at low chamber pressures, the optimum inlet pressure for the sectioned channel is lower by an order of magnitude than that for the channel with solid electrodes. This difference decreases with increasing chamber pressures. A chamber pressure of roughly 2 atm abs is optimal for maximum power, while a pressure of 18 atm abs is optimum for specific volumetric power. V.P.

A71-23441 # Optimization theory of Hall MHD generator duct. Jürō Umoto and Maomi Makino (Kyoto University, Kyoto, Japan). *Kyoto University, Faculty of Engineering, Memoirs*, vol. 32, Oct. 1970, p. 405-415. 7 refs.

Derivation of a new digital calculation to aid in designing an optimum Hall generator duct with constant velocity and constant or distributed Mach number. The calculation makes an integral given by a Carter minimum that expresses the duct size under the condition of extracting a needed output power when the applied magnetic flux density, mass flow, inlet stagnation pressure, and temperature in the duct are held constant. It is shown that the optimization theory can be applied not only to a diverging rectangular duct, but also to an annular one. F.R.L.

A71-24218 High pressure ratio centrifugal compressors for small gas turbine engines. R. E. Morris and D. P. Kenny (United Aircraft of Canada, Ltd., Longueuil, Quebec, Canada). In: *Advanced centrifugal compressors*. New York, American Society of Mechanical Engineers, 1971, p. 118-146. 10 refs. Research supported by the Defence Research Board of Canada and United Aircraft of Canada.

It is pointed out that poor specific fuel consumption of the gas turbine has been a major factor in preventing its general use. The variation of specific fuel consumption and specific power with cycle pressure ratio and turbine inlet temperature is investigated, and some data on the performance of single stage centrifugal compressors with pressure ratios in the range 10:1 to 15:1 are presented. It is found that a major problem with high pressure ratio compressors is the avoidance of separation within the impeller. Research impellers which have been designed initially by a relatively simple potential flow method are described. Loading diagrams are evaluated by a novel pipe analogy method. A novel diffuser capable of accepting the nonuniform supersonic flow from the impeller with low loss and good operating range is discussed. G.R.

A71-25894 Power limitation of an incore thermionic cell. W. Haug and E. Wolf (Stuttgart, Universität, Stuttgart, West Germany). In: *Institute of Electrical and Electronics Engineers,*

Annual Thermionic Conversion Specialist Conference, 9th, Miami Beach, Fla., October 26-29, 1970, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 357-360. 6 refs. Research supported by the Bundesministerium für Bildung und Wissenschaften.

The thermal and electrical characteristics of a single incore thermionic cell are determined on the basis of a theoretical model during the steady state operation. For this purpose, a numerical method was developed using the two-dimensional analytical solution of the heat conduction problem for the cylindrical emitter body of the cell. The limitation of electrical power output by a maximum emitter surface temperature (2000 K) and a maximum permissible thermal power (70 W/sq cm) is studied. (Author)

A71-25899 Optimization of the quasi-vacuum mode thermionic converter. Morton S. Mayer, John G. DeSteele, and Elric W. Saaski (McDonnell Douglas Astronautics Co., Donald W. Douglas Laboratories, Richland, Wash.). In: *Institute of Electrical and Electronics Engineers, Annual Thermionic Conversion Specialist Conference, 9th, Miami Beach, Fla., October 26-29, 1970, Conference Record*. New York, Institute of Electrical and Electronics Engineers, Inc., 1970, p. 388-394. 16 refs.

Quasi-vacuum mode thermionic energy conversion is the basis of the developing ISOMITE thermionic radionuclide battery concept now being considered for application in space and remote terrestrial power supplies. Two computer codes are described which calculate optimum converter design characteristics for converter modules in the power range from 10 mw(e) to 10 w(e). The codes account for all components of the converter thermal balance except back-emission heating, which appears to be negligible in optimized converters. Use of the computer codes has demonstrated a correlation of converter parameters with emitter thermal flux density. For many space-applicable converters operating in zero gravity, the correlation may be used directly for design purposes. For terrestrial devices where area-independent emitter support losses occur, the basic flux correlation is readily modified. The influence of surface properties on converter efficiency is illustrated by a theoretical comparison of converter output using electrode combinations of tantalum, tungsten, oxygenated tantalum, oxygenated tungsten, and iridium. An experimentally observed surface temperature dependence of the Ta-O-Cs work function minimum region is described and correlated for input to the converter optimization routine. Data from a laboratory test device with oxygenated tantalum electrodes show general agreement with calculation. (Author)

A71-26099 # Fundamentals of thermionic and magneto-hydrodynamic energy conversion (Osnovy termoelektronnogo i magnitogidrodinamicheskogo preobrazovaniia energii). K. M. Aref'ev and I. I. Paleev. Moscow, Atomizdat, 1970. 216 p. 244 refs. In Russian.

The basic physical processes occurring in thermionic and MHD converters of thermal energy into electric energy are reviewed, including data on the operation of the generators. The basic theory of thermionic emission and gas ionization is explained, the operation of vacuum and quasi-vacuum thermionic converters is described, the elements of low-temperature plasma physics are outlined, and data on the operation of a plasma thermionic converter are presented. The physical bases of MHD conversion are summarized, data on the electrical conductivity of the plasma used in MHD generators are presented, as well as data on the operation of the generators themselves, and the operation of closed-cycle MHD generators under conditions of nonequilibrium ionization is investigated. The operation of liquid-metal and ac MHD generators is also considered. A.B.K.

A71-29879 # Performance of a large scale, nonequilibrium MHD generator with rare gases. B. Zauderer and E. Tate (General Electric Co., King of Prussia, Pa.). *AIAA Journal*, vol. 9, June 1971,

p. 1136-1143. 17 refs. Navy-supported research.

An experimental study was performed of the operating characteristics of a shock-tunnel driven, supersonic MHD generator. The following major results were obtained: (1) Uniform preionization was required at the generator entrance to achieve appreciable generator power output. (2) The open circuit, induced voltages were in good agreement with the theory. (3) The electrical characteristics and plasma properties of the loaded, Faraday generator were in agreement with the predictions of the one-dimensional electron conservation equations, and Ohm's law if the conductivity was computed on the assumption that the plasma was homogeneously turbulent. (4) When the slope of the axial velocity and pressure gradients changed signs, a nonstationary shock-wave formed in the generator which led to boundary-layer separation and eventual generator current cutoff. (5) The maximum generator power of 500 kw was equal to 7 1/2% of the thermal power input. (6) The electrical performance of the present generator was similar to that measured in a generator having 2% of the volume of the present generator. It is concluded that electrode conduction losses and shock-wave formations were the two major factors limiting the efficiency of this generator. (Author)

A71-29880 # Effects of electrode size on the performance of a combustion-driven MHD generator. E. S. Rubin and R. H. Eustis (Stanford University, Stanford, Calif.). *AIAA Journal*, vol. 9, June 1971, p. 1162-1169. 18 refs. USAF-supported research.

Electrode sizes with length-to-pitch ratios of 0.23, 0.50, and 0.79 were tested in a generator section simulated by three molybdenum electrode pairs located at the downstream end of an MHD channel. Voltage probe data were obtained for electrode surface temperatures between 500 and 1600 K, with gas conductivity in the electrode boundary layer regions established by either a hot or cold upstream wall. At a given load current, larger electrodes were found to have lower voltage losses for similar conditions of surface and gas boundary-layer temperature. For dissimilar boundary layers, reflecting coupling between electrode and boundary-layer temperatures in a cold-electrode generator, total voltage losses for a large electrode pair were equal to or greater than those of a small electrode pair at the same surface temperature. Experimental boundary-layer resistances were in good agreement with analytical predictions for electrode temperatures above 800 K. For cathodes, the boundary-layer resistance was gasdynamic for the case of a hot upstream wall, for electrode current densities below that of saturated thermionic emission at the electrode temperature. O.H.

A71-30801 * A design for thick film microcircuit dc-to-dc converter electronics. H. M. Wick, Jr. (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) and S. Capodici (General Electric Co., Philadelphia, Pa.). (*Institute of Electrical and Electronics Engineers, Power Conditioning Specialists Conference, Greenbelt, Md., Apr. 20, 21, 1970.*) *IEEE Transactions on Aerospace and Electronic Systems*, vol. AES-7, May 1971, p. 528-531.

The design concept for thick film microcircuit dc-to-dc converter electronics used in the power subsystem of the Thermoelectric Outer Planet Spacecraft is presented. Microcircuits have been used in low power logic circuits for nearly ten years, but only recently have these techniques been applied to power subsystem circuits which operate at higher power levels. Thick film microcircuit techniques have been utilized in a dc-to-dc converter reducing weight by 70%, volume by 80%, and interconnections by 75%. The close piece-part spacing allowed short interconnections and lower dissipation, and reduced noise coupling. The developed microcircuit handled total power levels from one watt to twenty-five watts. (Author)

A71-32212 * Performance of the electrically-heated 2 to 15 kW Brayton power system. John L. Klann, Richard W. Vernon, David B. Fenn, and Henry B. Block (NASA, Lewis Research Center, Cleveland, Ohio). *American Institute of Aeronautics and Astro-*

navics, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, and Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, 5th, Las Vegas, Nev., Sept. 21-25, 1970, Paper. 7 p. 13 refs.

Initial results from two separate tests of the power conversion system are presented and compared to performance predictions. These results are based on 2250 hours of accumulated testing. About 1000 hours of that time was continuous operation at design temperatures in a vacuum-chamber test. No major technological problems were encountered in system operation. With the design working gas mixture of helium and xenon and at design temperatures, a gross alternator power output up to 12 kilowatts was demonstrated in these initial tests. The corresponding measured power-conversion-system gross efficiency was 33 percent with an estimated net efficiency of 29 percent. Measured conversion efficiencies with the gas mixture of helium and xenon were about 1 percentage point below the predicted level. Measured krypton efficiencies at design temperature exceeded predictions by about 2 percentage points. (Author)

A71-32223 * The design of components for an advanced Rankine cycle test facility. J. A. Bond (General Electric Co., Cincinnati, Ohio). *American Institute of Aeronautics and Astronautics, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers, and Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, 5th, Las Vegas, Nev., Sept. 21-25, 1970, Paper. 7 p. 6 refs. Contract No. NAS 3-9426. (GESP-451)*

The design of a facility for testing components of an advanced Rankine cycle power system is summarized. The facility is a three-loop system in which lithium, potassium and NaK-78 are the working fluids of the primary, secondary and heat-rejection loops, respectively. Design bases and performance predictions for the major loop components, including the lithium heater and the potassium boiler, condenser and preheater, are outlined. (Author)

A71-32274 # Development and production of electrical machines and magnetic systems using superconductors (O razrabotke i sozdanih elektricheskikh mashin i magnitnykh sistem na sverkhprovodnikakh). Iu. V. Blokhin, G. G. Borzov, S. N. Pylina, and V. N. Shakhmatin. In: Certain problems in studying gas discharge plasmas and creating strong magnetic fields (Nekotorye voprosy issledovaniia gazorazriadnoi plazmy i sozdaniia sil'nykh magnitnykh polei). Edited by V. G. Novitskii. Leningrad, Izdatel'stvo Nauka, 1970, p. 132-143. In Russian.

Consideration of the problem of drafting designs of large electrical machines and magnetic systems using superconductors. A description is given of a model of an electrical dc collector machine and of an MHD-type magnetic system using superconductors. It is shown that in the case of a high-power dc collector machine the use of superconducting materials for the excitation winding makes it possible, without adding to the weight of the machine, to increase the power output of the machine by a factor of 2.33 with a simultaneous increase in efficiency of 1.7%. A.B.K.

A71-32853 # The incore-thermionic-reactor as power supply for a direct-to-home TV satellite. Wolf Rasch (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für elektrische Antriebe und Energieversorgung, Braunschweig, West Germany). *Deutsche Gesellschaft für Luft- und Raumfahrt, British Interplanetary Society, Société Française d'Aéronautique, and Associazione Italiana di Aerotecnica, European Space Symposium, 11th, Berlin, West Germany, May 24-26, 1971, Paper. 24 p. 15 refs.*

Evaluation of the technical problems of a direct-to-home TV satellite, with a view to providing universal TV facilities at low cost. For a power source, the incore thermionic reactor (ITR) was selected. In such a reactor thermal power is converted to electrical power without moving of masses. The temperature level of the waste

05 ENERGY CONVERSION

heat (600 C) is relatively high, so heat radiation is possible using a relatively small and light radiator. The electric power output can be varied between 20 and 200 kW by variation of the number of thermionic fuel rods, thus providing optimized power-to-weight ratios for all desired powers in this region. The operational lifetime is fixed at two years. The technology involved is considered to be available now. Aspects of launching are discussed. F.R.L.

A71-33037 Some aspects of the conversion of chemical energy to mechanical work. I. M. Kovtun, A. N. Naumov, and S. L. Kosmatov (Vsesoiuznyi Zaochnyi Politehnicheskii Institut, Moscow, USSR). (*Teplofizika Vysokikh Temperatur*, vol. 8, Sept.-Oct. 1970, p. 1056-1063.) *High Temperature*, vol. 8, Sept.-Oct. 1970, p. 983-990. Translation.

Theoretical study of the production of work from a chemical reaction resulting from the irreversible mixing of reacting materials without separation of the products of the reaction. Conditions for the production of work during a chemical reaction in a Vant Hoff box are studied when the temperature of expansion is higher than that of contraction. It is shown theoretically that work can be obtained from a chemical reaction conducted without changes in volume in a Vant Hoff box without semipermeable partitions. It is also found that reactions involving no changes in the numbers of moles are necessary for a conversion of chemical-into-mechanical energy in the absence of semipermeable partitions with efficiencies higher than that of a Carnot cycle. V.Z.

A71-33525 * Status of advanced Rankine power conversion technology. Jerry R. Peterson (General Electric Co., Evendale, Ohio), Jack A. Heller, and Martin U. Gutstein (NASA, Lewis Research Center, Cleveland, Ohio). *American Nuclear Society, Annual Meeting, 17th, Boston, Mass., June 13-17, 1971, Paper 26 p. 35 refs.* (GESP-623)

A summary is presented of the recent development and test results of the advanced Rankine system which is a turboelectric nuclear space power system based upon the boiling-condensing Rankine cycle that employs potassium as the working fluid. The current status of system materials technology, heat transfer components, liquid metal pumps, and the potassium turboalternator is discussed. It is shown that no barrier problems are foreseen, and few areas requiring development remain. The technology has reached the point where a breadboard system test could be conducted with a high probability of initial success. O.H.

A71-34227 * # Electric power for space satellites. Charles M. Mackenzie (NASA, Goddard Space Flight Center, Space Power Technology Branch, Greenbelt, Md.). *ITU Telecommunication Journal*, vol. 38, May 1971, p. 245-247.

The electric power system of a space vehicle performs the functions of energy conversion, energy storage, and energy processing. The sources of electric power for today's space programs are chemical, solar, and nuclear. A power system consists of a source, a reserve or storage element, interconnections, and a load. A solar-conversion energy-storage power system is described. The life-limiting factor of the power system is usually the secondary battery used as storage element. G.R.

A71-34720 # Candidate electrical power systems for Space Station. L. H. McCarty (General Electric Co., Valley Forge, Pa.) and J. E. Boretz (TRW Systems Group, Redondo Beach, Calif.). *American Institute of Aeronautics and Astronautics, Space Systems Meeting, Denver, Colo., July 19, 20, 1971, Paper 71-825*. 11 p. 7 refs. Members, \$1.50; nonmembers, \$2.00.

The proposed NASA Space Station demands a highly reliable power system which must deliver 25 kWe throughout the Station's ten-year life. Three candidate power systems proposed for this purpose are described. They are the Zirconium Hydride Reference

Reactor teamed with a Brayton cycle or thermoelectric power conversion system, the Isotope-Brayton power system, and the Solar Array-Battery system. The Reactor system offers the greatest growth capacity, the Isotope-Brayton system is the most compact and can be conveniently arranged in modules, and the Solar-Array-Battery system is the most space qualified. O.H.

A71-35273 Pulsed model of a magnetohydrodynamic generator having a strongly nonequilibrium plasma. V. S. Golubev, M. M. Malikov, and A. V. Nedospasov (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR). (*Teplofizika Vysokikh Temperatur*, vol. 8, Nov.-Dec. 1970, p. 1265-1273.) *High Temperature*, vol. 8, Nov.-Dec. 1970, p. 1185-1192. 24 refs. Translation.

Study of a pulsed MHD generator model with a strong difference between electron temperature and gas temperature caused by supersonic motion of the preliminarily ionized gas in a strong magnetic field. The current-voltage characteristics of this generator are obtained, and it is found that they correspond to a takeoff power ranging from 20 to 100 W/cm. This power and the magnitude of effective conductivity agree quantitatively with the phenomenological theory of a plasma with turbulent conductivity and an effective Hall parameter equal to about unity. Z.W.

A71-36404 * # Hydrogen depolarized cell for a CO2 concentrator. Harlan F. Brose (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *American Society of Mechanical Engineers, Society of Automotive Engineers, and American Institute of Aeronautics and Astronautics, Life Support and Environmental Control Conference, San Francisco, Calif., July 12-14, 1971, ASME Paper 71-AV-37*. 8 p. Members, \$1.00; nonmembers, \$3.00. Contract No. NAS 9-10273.

Carbon dioxide (CO2) concentrator research has been oriented toward concepts minimizing moving parts and applicable to modular construction. The hydrogen depolarized cell is such a device. The unit utilizes the energy of a fuel cell reaction to pump CO2 from a low partial pressure at the cathode (air side) to a high partial pressure at the anode (hydrogen side). The process is continuous and is capable of operating efficiently at a cabin CO2 partial pressure of 1 mm Hg. Hamilton Standard has been conducting prototype cell testing, for the NASA Manned Spacecraft Center in support of the space station prototype (SSP). This paper describes the hydrogen depolarized cell CO2 concentrator and summarizes the test results obtained from the SSP effort. (Author)

A71-37122 * # Electrical power systems for space - Achievements and issues. P. Rex Miller (NASA, Washington, D.C.). *Astronautics and Aeronautics*, vol. 9, Aug. 1971, p. 22-30.

The achievements made in the field of electrical power systems during the past decade of space exploration are reviewed giving attention to batteries, solar cells, fuel cells, and radioisotope thermoelectric generators. It is pointed out that these power systems, upgraded as necessary, can meet NASA mission needs through at least the mid-1970s. Beyond this, however, major improvements in these systems will be required and new systems will have to be introduced to support an orderly advance in space exploration. The existing technology base is examined, and possible progress in technology is discussed. G.R.

A71-37600 Trends in aircraft propulsion. George Rosen (United Aircraft Corp., Hamilton Standard Div., Windsor Locks, Conn.). *Canadian Aeronautics and Space Institute, Royal Aeronautical Society, and American Institute of Aeronautics and Astronautics, Anglo-American Aeronautical Conference, 12th, Calgary, Alberta, Canada, July 7-9, 1971, CASI Paper 72/10*. 16 p. 8 refs. Members, \$1.25; nonmembers, \$2.00.

Propulsion requirements for the next generation of civil aircraft are examined and some new and quite demanding needs are defined -

larger engine sizes, higher take-off thrusts, and much lower noise levels. The remarkable propulsion advances over the past two decades are charted and, from these, projections are made for the next round of improvements. All of the propulsion systems considered incorporate advanced technology gas turbine engines coupled with propulsors having a broad range of bypass ratio - from fans to propellers. This encompasses a new class of high-thrust, low-noise propulsor - the Prop-Fan - which is introduced as a needed intermediate propulsor between today's fans and propellers. This widening scope of available propulsors is shown to offer the aircraft designer much more flexibility in powerplant selection and a better opportunity to optimize his design. Although the primary focus is on civil aviation, wherever appropriate the commonality with military requirements has been indicated. (Author)

A71-38099 A combustion oscillator for MHD energy conversion. V. J. Ibberson, J. M. Beér, J. Swithenbank, D. S. Taylor, and M. W. Thring (Sheffield, University, Sheffield, England). In: Combustion Institute, Symposium (International) on Combustion, 13th, University of Utah, Salt Lake City, Utah, August 23-29, 1970, Proceedings. Symposium supported by the National Science Foundation, NSF Grant No. K-016286; the U.S. Air Force, Contract No. AF 44(620)-70-C-0075; the U.S. Navy, Contract No. N 00014-70-C-0075; NASA, Contract No. NSR-39-003-008; and the U.S. Army, Grant No. DA-ARO(D)-31-124-70-685. Pittsburgh, Combustion Institute, 1971, p. 565-572. 5 refs.

Description of an experimental combustion oscillator in which the flow of products of high-intensity combustion was modulated by a longitudinal traveling pressure wave. The heat input in the 2-in.-diam, 20-in. long combustor was 1 MW. The injector was of the water-cooled impinging type. Simultaneous measurements of pressure by Photoco pressure transducers and of electrical conductivity by a rf probe were made at two locations in the 40-in.-long combustor, at 12 and at 36 in. from the injector, in order that nonequilibrium (flame) and equilibrium types of ionization could be compared. Results showed that lean fuel/oxygen ratios and relatively low chamber pressure were favorable for promoting acoustic oscillations. On the basis of these results an experimental MHD rig was constructed with a 4-in.-diam 10-in.-long combustor equipped with an impinging jet-type injector. M.M.

A71-38901 Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings. Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971. 1374 p. Members, \$40.; nonmembers, \$55.

Papers covering new energy conversion techniques and equipment for spacecraft, automobiles, biomedical uses, underwater powerplants, and other applications. System designs and test data are given for solar cell arrays, Brayton-cycle spacecraft electric power systems, biomedical radioisotope thermoelectric generators, implantable fuel cells and piezoelectric converters, electric and internal-combustion automotive power systems, battery and fuel-cell underwater powerplants, fusion powerplants, and advanced fossil-fuel powerplants. New battery materials, power control concepts, ecological effects of emissions, noise and thermal pollution dangers, and problems of system reliability are considered. Extensive author and subject indexes are provided.

Individual items are abstracted in this issue.

T.M.

A71-38908 * Performance of a Brayton-cycle power conversion system using a helium-xenon gas mixture. Alfred S. Valerino and Lloyd W. Ream (NASA, Lewis Research Center, Cleveland,

Ohio). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings.

Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 211-219. 14 refs.

A Brayton power conversion system was operated in an ambient environment with a gas mixture of helium and xenon. The system was operated at a compressor inlet temperature of 80 F through a compressor discharge pressure range from 20 to 45 psia and through a turbine inlet temperature range from 1300 to 1600 F. Results indicated a net engine efficiency (excluding heat losses from the heat source) of approximately 30% at a compressor discharge pressure of 45 psia and a turbine inlet temperature of 1600 F. The gross power output measured at the alternator terminals for this condition was 13.2 kW. Compressor efficiencies on the order of 79% were obtained. With the blend of helium and xenon and with high turbine inlet temperatures (1300 to 1600 F), turbine static efficiency was slightly lower than with cold argon; the values were 87.5% and 88.8% with hot helium-xenon and cold argon, respectively. T.M.

A71-38910 * Experimental evaluation of the electrical subsystem of the 2-to-15 kW Brayton power conversion system. R. R. Secunde, J. E. Vrancik, and A. C. Spagnuolo (NASA, Lewis Research Center, Cleveland, Ohio). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings. Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 229-238. 9 refs.

The electrical subsystem of a 1200-Hz, 2- to 15-kW Brayton power conversion system consists of the auxiliary electrical equipment required for an integrated, self-contained power conversion system. The electrical components included consist of the speed controller, alternator voltage regulator, dc power supply, batteries, two inverters, two coolant loops including the 400-Hz motor-driven pumps, and the Brayton engine control system. The electrical subsystem, powered by a motor driven alternator, was evaluated under various system operating conditions in a vacuum environment in order to determine overall performance. Overall operation of the electrical subsystem was satisfactory. Deviations of system waveforms from a true sine wave have a small but measurable effect on the performance of individual components. Operation of the speed controller has a distorting effect on the 1200-Hz system voltage. T.M.

A71-38925 * Review of long life performance of lead telluride and silicon germanium RTG technologies. Richard S. Caputo (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.; General Electric Co., Space Div., King of Prussia, Pa.). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings. Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 478-482.

The nominal performance of current RTG programs is reviewed and performance predictions are made for long term operation based on the most recent module data. The RTG programs which are considered for service of up to 5 or 7 years are TRANSIT (ISOTEC), PIONEER (SNAP 19-TAGS) and INTEGRAL SNAP 27 which use a

05 ENERGY CONVERSION

lead telluride thermoelectric material, while the multi-hundred watt (MHW) silicon germanium generator is considered for missions as long as 12 years. The MHW system using the Atomic Energy Commission's Large Isotope Heat Source for near term missions or the greater development time Helipak heat source for later missions, holds the greatest potential for future RTG application. (Author)

A71-38927 Multihundred watt radioisotope thermo-electric generator (MHW-RTG). A. A. Pitrolo, A. J. Arker (General Electric Co., New York, N.Y.), and R. B. Morrow (AEC, Space Nuclear Systems Div., Washington, D.C.). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings.

Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 492-511. AEC Contract No. AT (29-2)-2824.

A summary of the significant results is presented covering the period October 1969 through March 1971. This program, a systems technology effort, is developing a 'work horse' system with high efficiency and long life, applicable to a wide range of potential space missions requiring 100 to 1000 watts of electrical power. It is scheduled for flight applications beginning in the mid-1970's. Discussed in this paper are: the performance and safety requirements for the system design and development; a description and performance parameters of the SiGe converter; a description and performance characteristics of the high temperature heat source for both operational and safety considerations; an examination of the system's growth flexibility by cascading with a low temperature stage to achieve even higher conversion efficiencies; and, finally the current program development schedule. (Author)

A71-38939 Chemical and thermal laser considered as an energy conversion system. A. G. Hammitt (TRW Systems Group, Redondo Beach, Calif.). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings.

Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 761-767.

The theory of optical energy conversion systems capable of converting thermal or chemical energy to electromagnetic radiation. In the ideal limit, the process is reversible and is subject to the usual thermodynamic limitations. Two lasing systems are described, each using gases which can be described by two temperatures: a vibrational and a translational-rotational temperature. One is a thermal system in which the energy is available from two heat sources at different temperatures. The other is a chemical system in which the energy is available from a chemical reaction. V.P.

A71-38949 Thermionic reactor technology - An overview.

D. S. Beard (AEC, Space Nuclear Systems Office, Washington, D.C.). In: Society of Automotive Engineers, Intersociety Energy Conversion Engineering Conference, Boston, Mass., August 3-5, 1971, Proceedings.

Conference co-sponsored by the American Chemical Society, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the American Institute of Chemical Engineers, and the American Nuclear Society. New York, Society of Automotive Engineers, Inc., 1971, p. 933-938. 14 refs.

An overview of the thermionic reactor technology efforts being conducted under government sponsorship in the United States is

presented and the progress since the 1970 IECEC conference highlighted. The relations of the technology development approach to power system concepts for possible space and special terrestrial applications are shown. Applicability of the technology being developed for thermionics is reviewed relative to possible applications or utilization in other fields. The thermionic reactor technology programs of France, Germany and the Soviet Union are briefly reviewed and compared with the U.S. program objectives and schedule. (Author)

A71-40020 MHD power generation. William D. Jackson (Avco Everett Research Laboratory, Everett, Mass.). *Zeitschrift für Flugwissenschaften*, vol. 19, Aug.-Sept. 1971, p. 380-390. 38 refs.

The direct conversion of heat into electricity by means of the interaction between a flowing, electrically conducting fluid and a magnetic field has been the subject of intensive investigation in several countries for the past fifteen years. The motivation for this work has been, and continues to be, the improvement of the efficiency and performance of thermal-electric power plants. This paper reviews the basic principles of magnetohydrodynamic (MHD) power generation and reviews the status of the field as of the beginning of 1971. While emphasis is placed on open cycle MHD systems, other types are briefly described, and the environmental aspects of MHD are discussed. (Author)

A71-40898 * # The practical use of magnetic cooling. G. V. Brown (NASA, Lewis Research Center, Cryophysics Section, Cleveland, Ohio). *National Academy of Sciences - National Research Council, International Congress of Refrigeration, 13th, Washington, D.C., Aug. 27-Sept. 3, 1971, Paper. 10 p.* 7 refs.

Today's high-field large-volume superconducting magnets remove constraints that previously confined magnetic cooling to LHe temperatures and usually to 1 K or lower. Magnetic fields of up to 15 T can significantly order a paramagnetic system as high as about 50 K. This means that a magnetic refrigerator could be an alternative to the gas working fluid refrigerator, which has low mechanical efficiency at low temperatures. Several other devices in applied magnetic fields might be practical. These include a magnetic sorption pump for helium or hydrogen vapor, a regenerator for temperatures below 20 K, and an adjustable isothermal heat source or heat sink. The useful temperature range of some of these devices may be extended higher by using ferromagnetic materials above their Curie points. (Author)

A72-10387 Radioisotope power systems. SAE Aerospace Information Report, AIR 1213, July 30, 1971. 20 p.

Discussion of candidate radioisotope power systems which are currently in varying stages of development for aerospace applications. Radioisotope heat source requirements, nuclear radiation characteristics, factors affecting the choice of a suitable isotope, shielding specifications, safety considerations, and features of system integration with the vehicle are covered in a manner detailing principal difficulties and feasible solutions. Functional diagrams, principles of operation, and design requirements are given for thermoelectric, thermionic, Rankine cycle, and Brayton cycle energy conversion subsystems. T.M.

A72-11064 2800 watt series inverter dc power supply. D. L. Cronin (TRW Systems Group, Redondo Beach, Calif.). In: PCSC '71; Power Conditioning Specialists Conference, California Institute of Technology, Pasadena, Calif., April 19, 20, 1971, Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 117-123.

A high efficiency, low weight silicon controlled rectifier power supply which supplies 28V at 100A is described. The power supply operates from a conventional 3 phase 120/208Vdc (50 to 1600 Hz) power source. The AC power source is converted directly to DC

which powers two SCR inverters operating phase displaced up to 12.5 kHz. The two inverter outputs are rectified and fed into a common output filter to complete the final power conversion step. Output metering and input/output circuit breakers are provided in a rack mounted unit designed for natural convection cooling. Efficient, high frequency operation of the inverter SCR's makes possible the high overall power supply efficiency and low weight. Extremely stable and accurate voltage regulation is implemented. Additional features are inherent short circuit capability and adjustable output current limiting. Several aspects of circuit design and performance are discussed. (Author)

A72-11207 # Investigation of optimal conditions for energy conversion in an MHD generator (Issledovanie optimal'nykh uslovii preobrazovaniia energii v MGD-generatore). B. Zaporowski (Poznań, Politechnika, Poznań, Poland). (Seminarium Poświęcone Zagadnieniom Magneto hydrodynamiki Stosowanej i Gazodynamiki Wysokich Temperatur, 3rd, Gdańsk, Poland, May 1970.) Instytut Maszyn Przepływowych, Prace, no. 54-55, 1971, p. 77-84. 5 refs. In Russian.

The influence of plasma energy parameters on the output power of an MHD generator is analyzed under the assumption that the magnetic induction and the local electric efficiency are constants. An experimental verification of the analytical results indicates that in order to ensure high conversion efficiency, the oxidizer should be heated to 1400 K and enriched to 50% molecular oxygen. It is shown that ion seeding decreases significantly the plasma temperature, and that the maximum value of the product of the electrical plasma conductivity in the absence of a magnetic field by the square of the plasma velocity is optimal for MHD generator operation. V.P.

A72-14376 * # What can nuclear energy do for society. F. E. Rom (NASA, Lewis Research Center, Cleveland, Ohio). American Institute of Aeronautics and Astronautics, Symposium on Uranium Plasmas: Research and Applications, 2nd, Atlanta, Ga., Nov. 15-17, 1971, Paper. 24 p. 12 refs.

Nuclear fuel is a compact and abundant source of energy. Its cost per unit of energy is less than that of fossil fuel. Disadvantages of nuclear fuel are connected with the high cost of capital equipment required for releasing nuclear energy and the heavy weight of the necessary shielding. In the case of commercial electric power production and marine propulsion the advantages have outweighed the disadvantages. It is pointed out that nuclear commercial submarines have certain advantages compared to surface ships. Nuclear powerplants might make air-cushion vehicles for trans-oceanic ranges feasible. The problems and advantages of a nuclear aircraft are discussed together with nuclear propulsion for inter-planetary space voyages. G.R.

A72-15696 # Reliability of converter networks of thermionic power supply equipments (Zuverlässigkeit der Konverternetzwerke von thermionischen Energieversorgungsanlagen). S. Dagbjartsson. Stuttgart, Universität, Institut für Kernenergetik, Dr.-Ing. Dissertation, 1970. 72 p. 24 refs. In German.

Taking into account the current-voltage characteristics of thermionic converters, the current and voltage values characteristic of the individual branches of a network are examined, particular attention being given to the failure of individual converters. The failure is considered to be a statistical event that occurs with equal probability in all converters during the operation of a converter network. This formalism makes it possible to calculate the network reliability as a function of the possible excess output at the beginning of the operation period. It has been found that the probability of failure of any converter is 5%, and that the emitter temperature of some converters, which is initially about 1860 K, exceeds with a probability of about 10% the temperature of 2000 K. O.H.

A72-15940 # 'Unitized' thermoelectric module concept. P. E. Eggers (Battelle Columbus Laboratories, Columbus, Ohio). American Society of Mechanical Engineers, Winter Annual Meeting,

Washington, D.C., Nov. 28-Dec. 2, 1971, Paper 71-WA/Ener-1. 11 p. 11 refs. Members, \$1.00; nonmembers, \$3.00.

This paper discusses a novel approach to the design and qualification of radioisotope thermoelectric generators. This approach, which involves hermetically sealed bellows-encapsulated thermoelectric elements, features not only the potential for greatly increased generator output power stability and reliability, but also the advantages of a standardized approach to generator design, fabrication, and qualification. All aspects of the proposed concept draw on presently available technology, including the utilized heat source design. (Author)

A72-16745 Power supply and power converters in satellites and spacecraft (Energieversorgung und Energiewandler in Satelliten und Raumfahrzeugen). W. Peschka (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Energie-wandlung und elektrische Antriebe, Stuttgart, West Germany). VDI-Z, vol. 113, Dec. 1971, p. 1451-1453. 51 refs. In German.

Review of recent advances made in the development of power sources and converters for use in satellites and spacecraft. Recent achievements in the development of batteries and fuel cells, radioisotopes, and nuclear reactors are discussed, as well as new developments in the design of solar cells and mechanoelectric, thermoelectric, thermionic, and inductive fluid dynamic converters. A.B.K.

A72-16936 * # Status of power generation experiments in the NASA Lewis closed-cycle MHD facility. R. J. Sovie and L. D. Nichols (NASA, Lewis Research Center, Plasma Power Generation Section, Cleveland, Ohio). American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 10th, San Diego, Calif., Jan. 17-19, 1972, Paper 72-103. 8 p. 8 refs. Members, \$1.50; nonmembers, \$2.00.

In this paper the design and operation of the closed-cycle MHD facility is discussed and results obtained in recent experiments are presented. The main components of the facility are a compressor, recuperative heat exchanger (preheater), heater, nozzle, MHD channel with 28 pairs of thoriated tungsten electrodes, cesium condenser, and an argon cooler. The heater can supply 1.1 MW of thermal power to a 2.27 kg/sec gas stream. The facility has been operated at temperatures up to 2100 K with a cesium-seeded argon working fluid. At low magnetic field strengths ($B = 0.2$ T), the open circuit voltage, Hall voltage and short circuit current obtained are 90, 69, and 47 percent of the theoretical equilibrium values, respectively. The Hall voltage and short circuit current decrease sharply with increasing magnetic field strength, however. Comparison of these data with a wall and boundary layer leakage theory indicates that the generator has shorting paths in the Hall direction. (Author)

A72-17304 * Minimum-energy control of a class of electrically driven vehicles. Y. E. Sahinkaya and R. Sridhar (Control Data Corp., Los Angeles, Calif.). IEEE Transactions on Automatic Control, vol. AC-17, Feb. 1972, p. 1-6. 6 refs. NASA-sponsored research.

A minimum-energy controller is designed and built for a class of electrically driven vehicles according to the theoretical concepts determined by the application of modern control theory. Theoretical results are obtained by making several justifiable assumptions in the dynamical equations of the system and solving the resulting stochastic optimal control problem by Bellman's dynamic programming technique. Several practical and economical considerations are taken into account for the mechanization of the minimum-energy control law. (Author)

A72-18290 Controlling the input of the reactants in hydrazine-oxygen fuel cell aggregates (Regelung der Zufuhr der Reaktanten bei Hydrazin-Sauerstoff-Brennstoffzellenaggregaten). H. Kohl Müller (Siemens AG, Forschungslaboratorien, Erlangen, West

05 ENERGY CONVERSION

Germany). *Messtechnik*, vol. 79, Dec. 1971, p. 290-293. 7 refs. In German. Research supported by the Bundesministerium für Verteidigung.

Demonstration that a quasi-continuous supply of reactants for hydrazine-oxygen fuel cells can be ensured by means of pulse-controlled solenoids, thereby increasing the efficiency of the plant. The long response time of the hydrazine sensor cell results in a control loop of sufficiently fast response to adapt the hydrazine feed to load fluctuations only in conjunction with a proportional-plus-integral controller with the load as the perturbation variable. The short response time of the oxygen sensors to an insufficient supply of oxygen results in a control loop in which only slight oxygen losses occur if used in conjunction with a proportional controller. A.B.K.

A72-18336 Self-regenerating molten-seed electrodes for magnetohydrodynamic power generators. B. Warszawski (Société Générale de Constructions Electriques et Mécaniques Alsthom, Massy, Essonne, France). *Energy Conversion*, vol. 12, Mar. 1972, p. 25-29.

Description of a projected electrode system conceived as a possible contribution to the problem of extending the useful life of open cycle MHD generators. It is shown that the use of self-regenerating molten-seed electrodes in MHD power generators makes it possible to inject active seed into the coldest regions of the gas flow where it is needed most and to reduce the main seeding in the combustion chamber. M.V.E.

A72-21275 Soviet civil gas turbine engines. *Interavia*, vol. 27, Feb. 1972, p. 158-161.

Review of Soviet gas turbine engine construction and performance on the basis of available published information and external characteristics. According to Soviet reports, turbojet, turboprop, and turboshaft engines installed in Aeroflot aircraft have proved extremely reliable. They are designed specifically for domestic air transport requirements and for the climatic conditions encountered in the country. Recent developments indicate that there is a tendency to replace turboprops by turbojets for medium and short range routes. Compared with Western engines, it appears that Soviet engines have relatively high rates of fuel consumption. Technical data for Soviet engines are tabulated. F.R.L.

A72-21414 A kilowatt rotary power transformer. S. H. Marx (Philco-Ford Corp., Palo Alto, Calif.) and R. W. Bounds (COMSAT Laboratories, Clarksburg, Md.). (*Institute of Electrical and Electronics Engineers, Power Conditioning Specialists Conference, California Institute of Technology, Pasadena, Calif., Apr. 19, 20, 1971.*) *IEEE Transactions on Aerospace and Electronic Systems*, vol. AES-7, Nov. 1971, p. 1157-1163. Research supported by the Communications Satellite Corp.

This paper describes the development of a rotary transformer for typical spacecraft applications. The transformer is built in modular sections, each capable of transferring 500 W across a gap at efficiencies greater than 88%, dc to dc. The design effort included a study of pertinent electrical characteristics required for typical spacecraft configurations, electrical design and analyses of the overall dc-dc converter, mechanical design of the transformer cores and their assembly, and a study of transformer core and winding characteristics. Breadboard test results have demonstrated the desired level of efficiency, satisfactory operation over temperature, and satisfactory electrical characteristics. (Author)

A72-22401 Electrode and insulation materials in magnetohydrodynamic generators. L. L. Fehrenbacher and N. M. Tallan (USAF, Aerospace Research Laboratories, Wright-Patterson AFB, Ohio). In: *Ceramics in severe environments; Proceedings of the Sixth University Conference on Ceramic Science, North Carolina State University, Raleigh, N.C., December 7-9, 1970.* (A72-22376 09-18)

New York, Plenum Press, 1971, p. 503-518; Discussion, p. 519, 520. 35 refs.

The operation and service environment of open and closed cycle MHD generators is described. The performance characteristics of candidate electrode and insulation materials and their peculiar limitations with respect to conductivity, mechanical and electrochemical erosion, thermal shock resistance, maximum allowable surface temperature, compositional stability (polarization and contamination), thermionic emission, and overall service life are discussed. Special emphasis is given to problems associated with the performance of various ceramic insulators and electrodes used in open cycle generators. Recommendations for research studies on specific ceramic compositions and systems showing potential as MHD generator channel materials are offered. (Author)

A72-23684 Goals and trends in heat transfer research. E. R. G. Eckert (Minnesota, University, Minneapolis, Minn.). *Wärme- und Stoffübertragung*, vol. 5, no. 1, 1972, p. 3-8. 12 refs.

Heat transfer research is instigated primarily by new developments in technology. In the last thirty years, the fields of gas turbines, aeronautics, astronautics, and nuclear power contributed many problems for basic heat transfer studies. These are discussed, and presently unsolved problems are enumerated. In recent years, thermal pollution and the possibility to achieve controlled fusion posed new challenges for heat transfer research. (Author)

A72-24700 Fuel cells. D. P. Gregory (Institute of Gas Technology, Chicago, Ill.). London, Mills and Boon, Ltd. (M & B Monograph, No. CE/7), 1972. 70 p. 19 refs. \$3.90.

Condensed outline of fuel cell technology, principles of operation, and applications. The thermodynamics of fuel cells and principles of electrode polarization are dealt with simply, and the requirements for a complete fuel cell system are outlined. Various types of fuel cells are described and classified, with particular attention to systems which have found practical applications. Some of the problems still to be solved are examined. F.R.L.

A72-25629 # Design and test evaluation of a liquid metal regenerator for gas turbines. S. Moskowitz and J. Horvath (Curtiss-Wright Corp., Wood-Ridge, N.J.). *American Society of Mechanical Engineers, Gas Turbine and Fluids Engineering Conference and Products Show, San Francisco, Calif., Mar. 26-30, 1972, Paper 72-GT-33*. 12 p. Members, \$1.00; nonmembers, \$3.00. Contract No. NOW-66-0738-a.

Description of a lightweight regenerator for a 4000-shp turbo-shaft engine in which liquid NaK is used as the heat transport fluid for heat transfer from the turbine discharge gas to the compressor discharge air. The regenerator design includes an exhaust gas-to-metal heat exchanger, a metal-to-compressor air heat exchanger, and a rotary liquid-metal induction pump, forming a single hermetically sealed liquid metal circuit. The results of an analytical study of the system and of performance and durability simulation tests are given and are compared with theoretical predictions. Special system component production methods are also described. V.Z.

A72-27721 A technique for determining the operational characteristics of a thermoelectric module. H. Y. Wong (Glasgow, University, Glasgow, Scotland) and W. Shakun (Torin Corp., Torrington, Conn.). *Energy Conversion*, vol. 12, June 1972, p. 41-44.

Description of a testing apparatus and technique for assessing the operational characteristics of a Peltier device for cooling. The technique makes it possible to obtain true characteristics, and indicates where improvement of the device performance can be obtained from the engineering standpoint. It gives reliable and repeatable results over the heat sink temperature range between 50 and -20 C. O.H.

A72-27722 Practical limits to the thermoelectric figure of merit. II. R. W. Ure, Jr. (Utah, University, Salt Lake City, Utah). *Energy Conversion*, vol. 12, June 1972, p. 45-52. 43 refs.

Upper limits on the figure of merit of materials for thermoelectric devices are derived using experimental values of the parameters on a wide variety of semiconducting materials. These results show that the practical maximum figure of merit is considerably smaller than the earlier proposed theoretical maximum.

O.H.

A72-27724 The potential role of jet compression in high temperature energy conversion. G. Angelino (Milano, Politecnico, Milan, Italy). *Energy Conversion*, vol. 12, June 1972, p. 69-75. 6 refs.

Discussion of the potential performance of a purely mechanical energy exchanger capable of reducing substantially the stagnation temperature of the working medium with limited losses, transferring the useful energy to a comparatively cold fluid flow. The exchanger is based on the ejector principle, and can operate either in combination with a MHD generator or, at lower temperatures, with mechanical expanders.

O.H.

A72-29351 Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. Symposium sponsored by the Argonne National Laboratory and University of Illinois. Edited by M. Petrick (Argonne National Laboratory, Argonne, Ill.). University, Miss., University of Mississippi, 1972. 376 p. \$15.

The papers are short reports dealing with work currently in progress. These include studies of nonequilibrium generators, combustion generators, plasma properties and diagnostics, liquid-metal MHD, plasma instabilities, MHD components, and system studies.

Individual items are abstracted in this issue.

F.R.L.

A72-29353 # The effects of electrode configuration on the performance of a Faraday type MHD generator. J. W. M. A. Houben, J. H. Blom, and L. H. Th. Rietjens (Eindhoven, Technische Hogeschool, Eindhoven, Netherlands). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. 1.3.1-1.3.6. 10 refs.

The influence of the electrode configuration on the performance of a linear, nonequilibrium, Faraday type MHD generator has been studied theoretically. Numerical, two-dimensional, calculations are carried out for a number of electrode configurations. In the mathematical model nonequilibrium ionization and relaxation effects in electron temperature and density are included. The velocity and temperature profiles are postulated. The Ar-Cs plasma conditions are taken from the Eindhoven shocktube experiment. The influence of electrode configuration with respect to voltage drops, axial leakages, emission problems and internal resistance is discussed. Comparison of flat electrodes in the generator wall with rod electrodes out of this wall results in a preference for the rod electrode configuration.

(Author)

A72-29354 # Influence of ionization turbulence on the performance of nonequilibrium plasma MHD generators. V. Zampaglione (Comitato Nazionale per l'Energia Nucleare, Laboratorio Conversione Diretta, Frascati, Italy). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. 1.4.1-1.4.5. 12 refs.

It is shown that the evaluations of the performance of nonequilibrium plasma generators, which are still currently based on approximate turbulent plasma equations, can lead to substantial inaccuracies. A correct evaluation of the effect of ionization turbulence on the performance of these generators is presented. Equations for current-voltage characteristics are derived and compared with experimental data.

O.H.

A72-29355 # Progress in analytical modeling of MHD power generators. S. T. Demetriades, G. S. Argyropoulos, and C. D. Maxwell (STD Research Corp., Pasadena, Calif.). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. 1.5.1-1.5.13. 19 refs. Contract No. F44620-70-C-0001.

A realistic analytical method of modeling MHD power generators has been developed, that has the ability (1) to give accurate quantitative prediction of the performance and efficiency of a generator channel as a function of its size, and (2) to dictate the choice of operating conditions and geometry that will optimize the efficiency and longevity of an MHD generator of a given size. The modeling is performed by numerical (digital) techniques. The local behavior at every point of an MHD channel is computed as a function of time by a unique solution, and the field distributions are then integrated to derive the overall performance characteristics. The effect of each one (or any combination) of the important physical mechanisms is investigated separately. This method has been applied to existing real-life devices and has given excellent agreement with the experimental results. It can be used as a practical engineering tool for predicting the overall performance and optimizing the design parameters of both open-cycle and closed-cycle MHD power generators before they are built.

(Author)

A72-29356 # Electrode effects and gas dynamic characteristics of a large, non-equilibrium MHD generator with cesium seeded, noble gases. B. Zauderer and E. Tate (GE Space Sciences Laboratory, King of Prussia, Pa.). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. 1.6.1-1.6.10. 16 refs. Navy-supported research.

An experimental study was performed to determine the factors limiting the power output of a linear, supersonic Faraday generator, having electrodes suspended in the gas flow. The test gases were cesium seeded neon or argon at 2000 to 4000 K stagnation temperatures and 5 to 11 MW thermal power levels. It was observed that the electrode current varies directly with the cesium concentration for electrode current densities of the order of tens of amp/sq cm. The electrode current was nearly independent of electrode temperature and surface area. It was concluded that the electrode conduction was due to the cesium ion flux at the cathode, and that 20% heat to electric conversion should be readily attainable by using a larger MHD channel or by operating at higher gas pressures, cesium concentrations, and magnetic field strengths.

M.V.E.

A72-29364 # Recent experimental results from a one-wavelength MHD induction generator. E. S. Pierson (Illinois, University, Chicago, Ill.). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. IV.2.1-IV.2.5. 9 refs.

An experimental one-wavelength-long MHD induction generator has been operated successfully on a NaK flow system with a variety of excitation conditions, including tests both with and without compensating poles. The experimental generator is described briefly. A Fourier series method of calculating the magnetic flux density, discussed previously, is extended to include power calculations. Initial results from over 200 data points are summarized, with detailed analysis to follow.

(Author)

A72-29365 * # Numerical analysis method for linear induction machines. D. G. Elliott (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. University, Miss., University of Mississippi, 1972, p. IV.3.1-IV.3.9. 12 refs.

05 ENERGY CONVERSION

A numerical analysis method has been developed for linear induction machines such as liquid metal MHD pumps and generators and linear motors. Arbitrary phase currents or voltages can be specified and the moving conductor can have arbitrary velocity and conductivity variations from point to point. The moving conductor is divided into a mesh and coefficients are calculated for the voltage induced at each mesh point by unit current at every other mesh point. Combining the coefficients with the mesh resistances yields a set of simultaneous equations which are solved for the unknown currents. (Author)

A72-31375 Characterizing thermoelectric generators. G. E. Guazzoni (U.S. Army, Electronics Technology and Devices Laboratory, Fort Monmouth, N.J.). *Instruments and Control Systems*, vol. 45, May 1972, p. 85-87.

During the past twenty years, properties of semiconductor materials such as PbTe, SiGe, and Bi₂Te₃ have been improved to the extent that thermoelectricity offers a practical means of power generation in some applications. Thermoelectrical principles are reviewed. The capability of a thermopile to convert applied heat to electric power depends strongly on the value of the internal resistance. The use of the effective working resistance as a performance parameter is considered. Parameters were evaluated at 40 to 50 hour intervals during a test, to obtain a continuous characterization of converter performance. G.R.

A72-32994 # Thermodynamics of systems directly converting chemical energy into electric energy (K termodinamike sistem priamogo preobrazovaniia khimicheskoi energii v elektricheskuiu). V. A. Grodtko and B. N. Markar'ian. *Akademiia Nauk SSSR, Izvestiia, Energetika i Transport*, Mar.-Apr. 1972, p. 150-159. 5 refs. In Russian.

Theoretical consideration of a reversible thermodynamic cycle for ideal direct chemical-to-electric energy conversion using electron gas as the working body. It is shown that the Gibbs-Helmholtz equations and some analogs of isotherm and isobar equations describe the behavior of electron gas in this application. Expressions are given to determine the performance characteristics of the associated electrochemical and thermoelectrochemical systems. Similarity of thermodynamic aspects is established for chemical-to-electric energy conversion systems and thermal-to-electric conversion systems. V.Z.

A72-33876 From electrocatalysis to fuel cells; Proceedings of the Seminar, Seattle, Wash., December 9-11, 1970. Edited by G. Sandstede (Battelle-Institut, Frankfurt am Main, West Germany). Seattle, University of Washington Press, 1972. 413 p. \$12.50.

The papers deal with research and development work performed for the entire field of fuel cells, with emphasis on the results of research on electrocatalysts. Included are discussions of the state of the art of fuel cell technology for a variety of fuel cell systems. Results obtained for secondary battery systems are used to compare the properties and applications of various energy conversion devices in the light of the last findings, and to discuss in what way and to what extent fuel cells and secondary batteries can supplement each other. Much attention is given to new organic and inorganic electrocatalysts and to electrotraction and implantable fuel cells.

Individual items are abstracted in this issue. V.P.

A72-33887 Outlook for alkaline fuel cell batteries. K. V. Kordesch (Union Carbide Corp., Parma, Ohio). In: From electrocatalysis to fuel cells; Proceedings of the Seminar, Seattle, Wash., December 9-11, 1970. Seattle, University of Washington Press, 1972, p. 157-164. 19 refs.

The present status and trends of alkaline cells are reviewed on the basis of published military contracts and industrial work during 1969-70. It is shown that carbon dioxide removal from the air is easy, and that the resulting improvements warrant the expense. This

makes the alkaline system a preferred choice, in particular, in the presence of a simple means of shutting down and starting up the fuel cell systems to provide long life expectancies, even on intermediate duty cycles. Applications ranging from portable batteries to vehicle power systems are examined. V.P.

A72-34583 * Detailed design of a 100-We multicell thermionic power supply. P. Rouklove (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.) and J. G. DeSteele (Donald W. Douglas Laboratories, Richland, Wash.). In: Annual Thermionic Conversion Specialist Conference, 10th, San Diego, Calif., October 4-6, 1971, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 59-67. 5 refs.

Confirmation of the general trends of a previously reported parametric study of plutonia-fueled thermionic generators in a detailed 100-We generator design. The detailed design takes into account the additional weight of system-integration components and shows that design refinements of all aeroshell components are possible when a specific generator configuration is considered. An optimized 100-We thermionic power supply design is presented, reflecting a 0.98 reliability goal after five years of operation. The optimum multicell array consists of 28 isomite converters, each producing approximately 3.6 We at end-of-life. The optimum arrangement of converters in the aeroshell is a four-column, seven-row stacking configuration connected electrically as a two-column, 14-row array. (Author)

A72-34603 Thermionic energy conversion with a Ba-Cs diode. R. Henne (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und Elektrische Antriebe, Stuttgart, West Germany). In: Annual Thermionic Conversion Specialist Conference, 10th, San Diego, Calif., October 4-6, 1971, Conference Record. New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 212-219. 7 refs.

The program of the Thermionic-group of the Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt in Stuttgart is discussed. Experiments with Ba-Cs-diodes and some important problems involved in the use of barium and their solutions in our laboratory are described. Results obtained with a plane Ba-Cs thermionic converter with polycrystalline molybdenum electrodes with variable spacing and the conclusions for future works are represented. (Author)

A72-34604 Output performance of a thermionic converter with an oriented tungsten /110/ emitter and a polycrystalline tungsten collector. V. C. Wilson (General Electric Co., Schenectady, N.Y.). In: Annual Thermionic Conversion Specialist Conference, 10th, San Diego, Calif., October 4-6, 1971, Conference Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1971, p. 220-224. 7 refs. Contract No. AT(04-3)-771.

Measurements were made of the power generated by a parallel plane thermionic converter with an oriented tungsten (110) emitter and a polycrystalline tungsten collector. The emitter had a vacuum work function of 5.06 eV. Curves have been made to compare the output of this converter with that of converters with identical emitters but collectors of Nb and Ni. With emitter temperatures from 1750 to 2150 K the converter with the W collector averaged about 8% more output power than the converter with the Nb collector. However, the converter with the Ni collector produced about 17% more power than the converter with the Nb collector. (Author)

A72-36139 # Summary of six years of converter tests in the laboratory (Bilan de six années d'essais de convertisseurs au laboratoire). M. Clemot, B. Gayte, and J. Tripet (Commissariat à

l'Energie Atomique, Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette, Essonne, France). *International Atomic Energy Agency and European Nuclear Energy Agency, International Conference on Thermionic Electrical Power Generation, 3rd, Jülich, West Germany, June 5-9, 1972, Paper, 16 p. 9 refs. In French.*

Results of a series of laboratory tests of the lifetime, performance and stability of thermionic converters. The test stands and measurement systems employed are described, and the characteristics of the converters tested are briefly cited. Test results are presented which deal with the causes of converter stoppage, the behavior of the emitters, the behavior of the collectors, the metal-ceramic seals, the cesium consumption in thermionic materials, the effect of gases contained in the collector material or present in the electrode gap on the performance stability, and the effect of mutual diffusion of molybdenum and tungsten in the emitter on this stability. A.B.K.

A72-36166 # Applications for in-core-thermionic-reactors. W. Rasch (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Braunschweig, West Germany). *International Atomic Energy Agency and European Nuclear Energy Agency, International Conference on Thermionic Electrical Power Generation, 3rd, Jülich, West Germany, June 5-9, 1972, Paper, 15 p. 10 refs.*

Consideration of the feasibility of using in-core thermionic reactors to meet future power requirements in Europe. The steady increase in power requirements for applications satellites and for submarines and underwater laboratories is noted, and an attempt is made to extrapolate these requirements to determine future needs of West Germany and Europe as a whole. Possible alternate sources of higher power are reviewed, including solar cell generators, thermoelectric and thermionic converters, and Rankine- or Brayton-cycle turbines. It is concluded that in comparison with other nuclear systems the in-core thermionic reactor is technically the best solution and the system with the greatest potential for further development. A possible application of the in-core thermionic reactor in a European TV broadcasting satellite is considered, and estimated development costs are cited. A.B.K.

A72-36192 # The maximum attainable efficiency of thermionic converters. K. Urbaniec (Warszawa, Politechnika, Warsaw, Poland). *International Atomic Energy Agency and European Nuclear Energy Agency, International Conference on Thermionic Electrical Power Generation, 3rd, Jülich, West Germany, June 5-9, 1972, Paper, 11 p. 9 refs.*

Differences between efficiency concepts based on different definitions are analyzed, taking into account the over-all efficiency, the intrinsic efficiency, and the electron efficiency. It is found that only the over-all efficiency has any significance for questions of energy conversion in connection with a comparison between thermionics and other conversion techniques. The theoretical limits of the over-all efficiency are investigated together with the optimum values for the parameters employed in converter design and operation. G.R.

A72-36332 Pulsed power - A new technology for controlled thermonuclear fusion. L. S. Levine (U.S. Navy, Naval Research Laboratory, Washington, D.C.). In: *Scanning the spectrum: Proceedings of the Tenth Annual Region 3 Convention, Knoxville, Tenn., April 10-12, 1972.* New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. Q1-1 to Q1-7. 43 refs. Research supported by the Defense Nuclear Agency and U.S. Navy.

The development of pulsed power technology has now reached the point where it may be able to make a significant contribution to the quest for controlled thermonuclear fusion. Existing pulsed power generators can produce powers of the order of 1 TW for times of the order of .1 microsec. Such generators are most commonly utilized to produce intense relativistic electron beams, and this paper briefly surveys the existing state of the art of generators and relativistic

beams. The paper also considers several of the methods that have been proposed for incorporating intense beams or pulsed plasma generators into controlled fusion schemes. (Author)

A72-36558 A turbine can power your pump. H. J. Dickinson (Martin Marietta Corp., Houston, Tex.). *Hydraulics and Pneumatics*, vol. 25, July 1972, p. 95-97.

A hot-gas turbine is an alternative to the electric-motor-driven pump power source. The turbine can be driven by cold gas for long periods of time prior to hot-gas operation. The component parts consist of pressure regulating valves, igniters, speed control, output shaft, axial-flow turbine wheel, and housing. Turbine speed may be regulated by parasitic load control supplied by a separate electric generator. The characteristics of liquid fuel systems and solid propellant systems are discussed together with a turbine system which combines ram air and a hot gas turbine. Continuous standby power may be supplied by driving the impulse turbine with ram air. G.R.

A72-39940 Energy-direct conversion today. II (Energie-Direktumwandlung heute. II). K. J. Euler (Gesamthochschule, Kassel, West Germany). *VDI-Z*, vol. 114, no. 11, Aug. 1972, p. 784-789. 27 refs. In German.

Thermionic reactors are considered, giving attention mainly to developments in the Federal Republic of Germany. Thermionic converters are basically electron tubes with an externally heated cathode and an externally cooled anode. Electrons emitted at about 2000 K from the cathodes, the emitter, pass to the collector, which has a temperature of 900 K. Thermoelectric current sources are gas-heated thermoelements consisting of p-ZnSb and Ni. Thermoelectric current sources are used for applications in the areas of communications, meteorology, geophysics, oceanography, and space exploration. Systems for nuclear auxiliary power systems are also discussed, taking into account their general design, operational principles, economic factors, and a thermoelectric nuclear system brought to the lunar surface in the Apollo 12 mission. G.R.

A72-43148 * # Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications. R. W. Graham and M. U. Gutstein (NASA, Lewis Research Center, Cleveland, Ohio). *American Society of Mechanical Engineers, Aerospace Conference, Anaheim, Calif., Sept. 10-13, 1972, Paper 72-Aero-12.* 9 p. 52 refs. Members, \$1.00; nonmembers, \$3.00.

A72-43723 Laser-produced plasma and fusion yield. L. S. Dzung (Brown Boveri et Cie. AG, Baden, Switzerland). *Zeitschrift für angewandte Mathematik und Physik*, vol. 23, Mar. 25, 1972, p. 301-310. 8 refs.

Lubin and Fraas (1971) have reported an engineering approach for utilizing for electrical power generation a method of plasma production which is based on the heating of small pellets of fusible material by laser radiation. In this approach the fusion energy is absorbed as thermal energy by liquid lithium. The lithium provides the heat source for a conventional power plant. One of the crucial questions regarding this approach is concerned with the required energy of the laser pulse. The results produced by various previous investigations of the question show great differences. The problem is carefully analyzed, taking systematically into account the effects of changing parameters. A gasdynamic model combining reasonable physical accuracy with sufficient mathematical simplicity is discussed. G.R.

A72-45179 * # United States Space Nuclear Electric Power Program. G. A. Newby (AEC-NASA, Washington, D.C.). *International Astronautical Federation, International Astronautical Congress, 23rd, Vienna, Austria, Oct. 8-15, 1972, Paper.* 22 p. 6 refs.

05 ENERGY CONVERSION

The principal characteristics and design features of major systems and technological developments in U.S. space nuclear power activities are reviewed, covering radioisotope thermoelectric generators, reactor space electric power technology, and the advanced liquid metal cooled power reactor program. The topics also include heat source design and development, thermoelectric efficiency, high performance thermoelectric materials, and alloy developments. The U.S. Space Electric Power Program is described as one aimed at the development of a minimum number of standard components and power modules for both radioisotopes and reactor systems that will meet the widest possible range of future requirements. The need to reduce the high cost of the isotopic generators already used in space missions is stressed. V.Z.

A73-10434 # Effect of heterogeneity and Hall current on the MHD power generator. N. Rudraiah, S. N. Murthy, and B. C. Chandrasekhara (Visvesvaraya College of Engineering, Bangalore, India). *Japanese Journal of Applied Physics*, vol. 11, Sept. 1972, p. 1372-1379. 13 refs.

A73-10616 # Certain problems in creating superconducting magnetic systems (Nekotorye problemy sozdaniia sverkhprovodiaschikh magnitnykh sistem). V. V. Sychev. *Akademiia Nauk SSSR, Izvestiia, Energetika i Transport*, July-Aug. 1972, p. 39-49. 11 refs. In Russian.

Detailed analysis of certain problems involved in ensuring reliable operation of superconducting magnetic systems. The advantages of superconducting magnetic systems over ordinary electromagnets are outlined, and problems involved in designing large superconducting magnetic systems are indicated. Particular attention is paid to the problem of preventing damage to the winding of a superconducting magnetic system through uncontrolled transition of the winding into the normal state. The use of a combination conductor to ensure stabilization of the superconducting state is described. A.B.K.

A73-11826 * Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. Conference sponsored by the National Science Foundation, NASA, Institute of Electrical and Electronics Engineers, American Institute of Physics, and U.S. Navy. New York, Institute of Electrical and Electronics Engineers, Inc., 1972. 746 p. \$20.

Recently developed practical applications of superconductivity are described in papers dealing with transportation and propulsion, power generation, power transmission, special-purpose magnets, superconducting materials, Josephson junctions, and microwave systems. Important topics considered include tracked magnetic-cushion vehicles, electrical machines, cryogenic underground power transmission systems, magnets for fusion reactors and particle accelerators, thin-film superconductors, effects of the structural characteristics of materials on transition temperatures, frequency measurement with Josephson devices, and superconducting scientific instruments. T.M.

A73-11828 Superconducting considerations in rotating electrical machines. Z. J. J. Stekly (Magnetic Corporation of America, Cambridge, Mass.). In: Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 47-56. 14 refs. USAF-supported research.

This paper deals with the problems associated with superconducting field windings. The basic requirements for the field are discussed in terms of size, magnetic energy stored, power level, speed of rotation, number of poles. While the field winding is basically dc in nature, it is exposed to time varying magnetic fields and forces due to the armature currents generated by loading transients, faults,

unbalanced electrical loads, as well as load generated harmonics. The effect of these on the design of the field as well as on the performance of the superconductor is discussed. (Author)

A73-11833 A review of the critical aspects of superconducting a.c. generators. A. D. Appleton and A. F. Anderson (International Research and Development Co., Ltd., Newcastle-upon-Tyne, England). In: Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 136-144. 7 refs.

The development of superconducting ac generators to meet future demands for electrical power is examined in terms of conversion efficiency, required manufacturing processes, and relative costs as compared to conventional turbogenerator machines. The critical aspects of superconducting ac generators are reviewed, using a 500-MW rating as the basis of comparison with conventional machines. The influence of machine geometry on the performance characteristics is outlined, with particular attention devoted to the effects of interwinding coupling factors. Principal mechanisms leading to machine losses are identified along with techniques used for their prediction and minimization. T.M.

A73-13388 * Design point characteristics of a 500 - 2500 watt isotope-Brayton power system. G. J. Barna (NASA, Lewis Research Center, Cleveland, Ohio). *American Institute of Aeronautics and Astronautics and Society of Automotive Engineers, Joint Propulsion Specialist Conference, 8th, New Orleans, La., Nov. 29-Dec. 1, 1972, AIAA Paper 72-1059*. 8 p. 5 refs. Members, \$1.50; nonmembers, \$2.00.

An analytical study was conducted to investigate the potential performance characteristics of an isotope-Brayton space power system at electric power levels from 500 to 2500 W. Utilization of the Pu 238 heat source, or capsule, being developed for the Multi-Hundred Watt Radioisotope Thermoelectric Generator was assumed. A single-loop system design concept was selected. The design concept and results of first-order tradeoff studies of the effects of major system parameters on system performance are presented. Results of the study indicate the potential for high system efficiency and high specific power over the entire power range. (Author)

A73-15118 # High temperature fuel cell system for the conversion of methane. R. Steiner, F. J. Rohr, and W. Fischer (Brown, Boveri et Cie. AG, Heidelberg, West Germany). In: International Symposium on Fuel Cells, 4th, Antwerp, Belgium, October 2, 3, 1972, Proceedings. Volume 1. Mol, Belgium, Commissariat de l'Energie Atomique, 1972. 22 p. 7 refs. Research supported by the Bundesministerium für Bildung und Wissenschaft.

High temperature zirconium dioxide electrolyte fuel cell systems are now at a state of development, where the problems concerning single cells are solved and where the voltage and the efficiency as a function of the output power are known. In this paper, fuel cell system characteristics are evaluated from these single cell quantities and some conclusions are drawn concerning possible applications. (Author)

A73-16586 # Analysis of optimal conditions for energy conversion in an MHD-generator channel (Analiz optimal'nykh uslovii preobrazovaniia energii v kanale MGD-generatora). E. V. Nazarov. *Magnitnaia Gidrodinamika*, July-Sept. 1972, p. 6-13. 13 refs. In Russian.

A73-16980 # Engineering problems in the design of controlled thermonuclear reactors. A. P. Fraas (Oak Ridge National Laboratory, Oak Ridge, Tenn.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 11th, Washington,*

D.C., Jan. 10-12, 1973, Paper 73-259. 8 p. 20 refs. Members, \$1.50; nonmembers, \$2.00.

Results of studies of the engineering problems that must be confronted when feasibility controlled thermonuclear reactors is demonstrated. The studies have disclosed that a large set of boundary conditions must be satisfied, and meeting these with a well balanced integrated design presents an exceptionally challenging set of problems. These include 30,000 to 70,000 G superconducting magnet coils 10 m in diameter, two-phase heat transfer and fluid flow of liquid helium, 4 K helium refrigeration systems, MHD effects on pumping power and heat transfer for large ducts carrying lithium at 1000 C in a niobium-zirconium alloy blanket structure, sputtering and radiation damage to the wall confining the plasma, and potassium-steam binary vapor cycle power conversion systems with a peak temperature of about 1000 C and a thermal efficiency approaching 60%. (Author)

A73-17641 # Fuel cells for improved electrical power supply. C. C. Morrill (United Aircraft Corp., Pratt and Whitney Aircraft Div., East Hartford, Conn.). *American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display, 9th, Washington, D.C., Jan. 8-10, 1973, Paper 73-82.* 7 p. Members, \$1.50; nonmembers, \$2.00.

Current commercial fuel cell technology and the requirements of utility applications lead to a fuel cell system design which is modular in configuration and is composed of three major subsystems. The subsystems include a fuel processor, a fuel cell power section, and an inverter. Fuel cell operational characteristics are discussed, giving attention to its high efficiency, its environmental characteristics, the load response, and the operational modes. G.R.

A73-17667 * # Review of controlled fusion research using laser heating. A. Hertzberg (Washington, University, Seattle, Wash.). *American Institute of Aeronautics and Astronautics, Aerospace Sciences Meeting, 11th, Washington, D.C., Jan. 10-12, 1973, Paper 73-258.* 44 p. 63 refs. Members, \$1.50; nonmembers, \$2.00. NSF Grant No. GK-28562; Contract No. AT(45-1)-2225; Grant No. NGR-48-002-044.

Development of methods for generating high laser pulse energy has stimulated research leading to new ideas for practical controlled thermonuclear fusion machines. A review is presented of some important efforts in progress, and two different approaches have been selected as examples for discussion. One involves the concept of very short pulse lasers with power output tailored, in time, to obtain a nearly isentropic compression of a deuterium-tritium pellet to very high densities and temperatures. A second approach utilizing long wavelength, long pulse, efficient gas lasers to heat a column of plasma contained in a solenoidal field is also discussed. The working requirements of the laser and various magnetic field geometries of this approach are described. (Author)

A73-17668 New energy systems for space flight (Neue Energiesysteme für die Raumfahrt). W. Peschka (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Energiewandlung und elektrische Antriebe, Stuttgart, West Germany). Munich, Wilhelm Goldmann Verlag (Das Wissenschaftliche Taschenbuch, Abteilung Technik und Technologie. Part 5), 1972. 212 p. 107 refs. In German. \$10.75.

Energy requirements for space applications are examined. Chemical energy sources are suitable in cases in which a high power is needed for short time intervals. One of the most important energy sources is provided by solar radiation. The characteristics of nuclear energy are also considered, taking into account radioactive isotopes and processes based on fission or fusion. Devices for the conversion of energy include electrochemical systems of various types, photoelectric systems, thermoelectric systems, thermionic systems, and mechanoelectrical systems. The design of energy systems of various types is discussed, taking into account photovoltaic devices, nuclear space power systems, and magnetogasdynamic systems. G.R.

A73-20107 Large-scale applications of superconducting coils. Z. J. J. Stekly and R. J. Thome (Magnetic Corporation of America, Waltham, Mass.). *IEEE, Proceedings*, vol. 61, Jan. 1973, p. 85-95. 52 refs.

After a brief review of the main characteristics of superconductors and superconducting windings in general, specific applications of superconducting coils are discussed. These include high-energy physics, controlled thermonuclear fusion, MHD power generation, inductive energy storage, and levitation of high-speed ground vehicles. Photographs and illustrations are included to describe some of the existing systems as well as some systems which are presently conceptual in nature. (Author)

A73-20396 Energy conversion dynamics. H. K. Messerle (Sydney, University, Sydney, Australia). *Energy Conversion*, vol. 13, Jan. 1973, p. 19-23. 10 refs.

An attempt is made to show how irreversible thermodynamics and losses can be accounted for as an extension of energy conversion statics. The N-port representation of a storage element is discussed together with reversible electro-caloric relations, flux rates, power flow and energy function, and state space relations. In conclusion, it is stated that general system equations for directly coupled and connected system elements can be related to the basic stored energy function if loss flux rates in the incremental performance relations are taken into account. G.R.

A73-20467 * # Isotope Brayton space power systems and their technology. H. Schwartz (NASA, Lewis Research Center, Cleveland, Ohio). *American Nuclear Society, International Meeting, 1972, Washington, D.C., Nov. 12-17, 1972, Paper.* 20 p. 8 refs.

The objectives of the NASA-Lewis Research Center Brayton Space Power Program and the advantages of achieving an isotope Brayton space power system are enumerated. The paper describes the 2-15 kW Brayton engine, its subsystems, and major components, and summarizes the status of the test program. Two areas of Brayton constituent technology are discussed - gas bearings and heat exchangers. A summary is given of a 500-2500 W isotope Brayton space power system study that showed very attractive performance, simplicity, and low cost for a system in this power range. (Author)

A73-22203 Self-contained submergeable energy sources (Sources d'énergie autonomes immergeables). Y. Touré (Ministère des Armées, Services Techniques, Paris, France). *(Association Technique Maritime et Aéronautique, Session, 72nd, Paris, France, May 15-19, 1972.) Association Technique Maritime et Aéronautique, Bulletin*, no. 72, 1972, p. 119-138; Discussion, p. 139. 6 refs. In French.

Thermoelectric radioisotope generators and nuclear thermoelectronic reactors are discussed. The former have a low electric power density (about one watt/sq cm), and the latter have a high power density (about 10 watt/sq cm). The principles upon which they are based, and the actual state of their specific characteristics are described. Since each functions by direct conversion of heat to electricity, their operation is anaerobic, self-contained, and reliable, and hence are particularly suited for service under water. The French program in this field is reviewed. F.R.L.

A73-22751 Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Conference sponsored by ACS, AIAA, ASME, IEEE, AIChE, ANS, and SAE. Washington, D.C., American Chemical Society, 1972. 1543 p. Members, \$50; nonmembers, \$60.

Topics discussed include fuel-cell and battery technology; silicon-germanium thermoelectric technology; life performance of thermoelectric materials and generators; thermoelectric power generation and cooling; advanced prime movers; manned space power systems; advanced unmanned spacecraft power systems; isotope

05 ENERGY CONVERSION

systems; reactor subsystems, power conditioning and computer simulation; solar power technology; biomedical energy systems; thermionic technology; military ground power; various advanced power generation, propulsion, and energy transfer systems; nuclear energy systems; and hydrogen energy systems.

Individual items are announced in this issue.

A.B.K.

A73-22752 Autonomous hydrogen/air fuel cell for long-life missions. Y. Breille, J. Cheron, A. Grehier (Institut Français du Pétrole, des Carburants et Lubrifiants, Rueil-Malmaison, Hauts-de-Seine, France), and R. Vic (Compagnie Industrielle des Piles Electriques, France). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 1-6.

Design and construction of an autonomous H₂/air fuel cell for the purpose of power feeding a 70-W radio-beacon for 5000 hr. The reliability required for this use led to the development of a cell operating at low specific power and with no rotating parts. The results obtained during climatic tests (minus 30 to plus 50 C) and endurance tests (seven months) show that the reliability of this generator is similar to that of standard cells. (Author)

A73-22766 * Hybrid TE panel test results. W. J. Bitano (NASA, Lewis Research Center, Cleveland, Ohio). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 194-199.

Test results are presented for a nine couple (3 x 3 array) thermoelectric panel of hybrid thermocouples. In the hybrid couple, a hollow cylinder of p-type Si-Ge is used to encapsulate a segmented PbTe/Si-Ge n-leg. The hybrid couple is predicted to offer a 10 to 15% improvement in performance relative to all Si-Ge couples. The efficiency, output power, and internal resistance of the panel, as well as the resistances of the individual hybrid couples, are presented as a function of test time covering a period of more than 2600 hours. Initial test results indicated hybrid couple performance consistent with design predictions. However, the 10 to 15% improvement over all-Si-Ge couples demonstrated initially by the hybrid couple was offset by the high resistance that developed following a thermal cycle due to heater failure after 600 hours of testing. (Author)

A73-22793 * Isotope Brayton electric power system for the 500 to 2500 watt range. R. P. Macosko, G. J. Barna, H. B. Block, and B. D. Ingle (NASA, Lewis Research Center, Cleveland, Ohio). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 522-527. 6 refs.

An extensive study was conducted at the Lewis Research Center to evaluate an isotope Brayton electric power system for use in the 500 to 2500 W power range. The study emphasized overall system simplicity in order to reduce parasitic power losses and improve system reliability. The study included detailed parametric cycle analysis, conceptual component designs, and evaluation of system packaging. The study has resulted in the selection of a single-loop system (gas) with six major components including one rotating unit. Calculated net system efficiency varies from 23 to 28% over the power range. The use of the Pu-238 heat source being developed for the Multi-Hundred-Watt Radioisotope Thermoelectric Generator program was assumed. (Author)

A73-22799 Nuclear power system study. J. H. Van Osdol, R. F. Wilson (North American Rockwell Corp., Atomic International Div., Canoga Park, Calif.), J. E. Hengle (USAF, Space and Missile Systems Organization, El Segundo, Calif.), and D. E. Reardon

(AEC, San Francisco, Calif.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 559-567. Contract No. AT(04-3)-701.

A study was performed to determine the preferred nuclear power source for spacecraft using either of four types of cryogenic cooler cycles, i.e., the rotary reciprocator, Vuilleumier, turbo-brayton, or Stirling. These spacecraft require electrical power in the 1 to 4 kW range, long satellite life (3-5 years), and relatively low earth orbits. The nuclear power systems investigated included both radioisotope and reactor heat sources. For the radioisotope systems, RTG's and heat sources with Brayton or organic-Rankine power conversion systems were considered, with either plutonium or curium as the fuel. Reactor systems were limited to the zirconium-hydride reactor, with either thermoelectric, Brayton, or organic-Rankine power conversion systems. For the Vuilleumier cooler, where both electrical and thermal power were required, a radioisotope heat source was considered in conjunction with a solar array. Spacecraft designs and integration concepts were developed for each type of power system over the range of mission and system parameters specified. (Author)

A73-22815 * Thermionic reactor program - An overview. D. S. Beard and J. J. Lynch (AEC-NASA, Space Nuclear Systems Office, Washington, D.C.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 1036-1040.

An overview of the AEC/NASA thermionic reactor program is presented with emphasis on the latest progress in this technology. The possible applications for utilization of thermionic reactors are reviewed and the joint AEC/NASA program approach to demonstrate thermionic technology is outlined. The thermionic reactor technology programs of France, West Germany, and the Soviet Union are highlighted. (Author)

A73-22821 The phosphoric acid fuel cell, a long life power source for the low to medium wattage range. O. J. Adhart (Engelhard Minerals and Chemicals Corp., East Newark, N.J.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 1097-1102. 6 refs.

A73-22823 * Hall current effects in the Lewis magneto-hydrodynamic generator. L. D. Nichols and R. J. Sovie (NASA, Lewis Research Center, Cleveland, Ohio). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 1125-1130. 8 refs.

Data obtained in the Lewis MHD generator are compared with theoretical values calculated using the Dzung (1966) theory. The generator is operated with cesium seeded argon as the working fluid. The gas temperature varies from 1800 to 2100 K, the gas pressure from 19 to 22 N/sq cm, the Mach number from .3 to .5, and the magnetic field strength from .2 to 1.6 tesla. The analysis indicates that there is incomplete seed vaporization and that Hall current shorting paths (through the working fluid to ground at both the entrance and exit of the channel) are limiting generator performance. (Author)

A73-22829 * Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion. J. R. Williams, Y. Y. Yung, K. D. Kirby, and J. D. Clement (Georgia Institute of Technology, Atlanta, Ga.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif.,

September 25-29, 1972, Proceedings.
Washington, D.C., American Chemical Society, 1972, p. 1305-1311.
19 refs. Grant No. NGR-11-002-145.

A73-23278 **Prospects for radiovoltaic energy conversion**
(*Perspectives en conversion d'énergie radiovoltaïque*). R. Bomal, A. Manin, and K. Steinschaden (Commissariat à l'Énergie Atomique, Centre d'Études Nucléaires de Saclay, Gif-sur-Yvette, Essonne, France). In: *Power from radioisotopes; International Symposium*, 2nd, Madrid, Spain, May 29-June 1, 1972, Proceedings.

Paris, Organisation de Coopération et de Développement Économiques, 1972, p. 223-240. 16 refs. In French.

There is a large field of utilization for conversion of radioisotopic energy by the radiovoltaic effect. The ionizing particles emitted by a radioisotopic source penetrate into a semiconductor and create 'electron-hole' pairs. A voltage appears at the boundary of the junction, and a current establishes itself. Tritium appears to be the most suitable element for commercialization of the process. Titanium-tritium sources and a semiconductor converter are described, and experimental results are given. The procedure for deposition of the titanium-tritium source on the semiconductor is outlined. Tritium microgenerators should find applications in time-keeping and in medicine. F.R.L.

A73-23279 **A model of a thermophotovoltaic radionuclide battery.** H. Rabenhorst and G. R. Tschulena (Battelle-Institut, Frankfurt am Main, West Germany). In: *Power from radioisotopes; International Symposium*, 2nd, Madrid, Spain, May 29-June 1, 1972, Proceedings.

Paris, Organisation de Coopération et de Développement Économiques, 1972, p. 241-252. Research supported by the Ministerium für Bildung und Wissenschaft.

The paper deals with a model of a thermophotovoltaic energy converter. Since the effective spectral range of a photoelectric element is generally small compared with the relatively large spectral range of the thermal radiation, the efficiency of such a system may be expected to be low. The difficulties can be avoided if a broad-band photocell of a material with a graded energy gap is used and the emission from the radiator is confined with an edge filter to a narrow spectral region. By proper choice of the filter and the photosensitive material, it is possible to ensure that the spectral curves of the radiator and the photocell largely overlap. The efficiencies which theoretically can be attained with such a system are indicated. First experimental results obtained on an (In, Ga)As photocell are reported. (Author)

A73-23280 **Practical limits of radiophotovoltaic conversion systems.** D. Schälch and A. Scharmann (Giessen, Universität, Giessen, West Germany). In: *Power from radioisotopes; International Symposium*, 2nd, Madrid, Spain, May 29-June 1, 1972, Proceedings.

Paris, Organisation de Coopération et de Développement Économiques, 1972, p. 253-258.

The aim of our work has been the experimental proof of theoretical considerations on power and efficiency limits of radiophotovoltaic devices. Different parameters determining conversion efficiency have been investigated systematically; conversion efficiency of different phosphors, deterioration of different phosphors, optimal thickness of the nuclide phosphor layer, optimal Pm-147 load on the phosphor, and efficiencies of different photocells are covered. (Author)

A73-23473 # **Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity** (*O printsiipal'noi vozmozhnosti preobrazovaniia kineticheskoi energii potoka ionizirovannogo gaza v elektrichestvo*). O. S. Vorob'ev, V. B. Eliseev, A. N. Ermilov, V. D. Zakharenko, I. V. Orfanov, and S. V. Riabikov. *Akademiia Nauk SSSR, Izvestiia, Energetika i Transport*, Nov.-Dec. 1972, p. 96-100. In Russian.

A73-24594 # **Optimization of superconducting magnetic MHD-generator systems** (*Ob optimizatsii sverkhprovodimicheskikh magnitnykh sistem MGD-generatorov*). O. Coufal (Ústav Speciální Elektroenergetiky, Brno, Czechoslovakia). *Magnitnaia Gidrodinamika*, Oct.-Dec. 1972, p. 115-118. 5 refs. In Russian.

Nonferrous magnetic systems generating a uniform magnetic field in a channel of rectangular cross section are examined. A system of this type is an elliptic winding formed by two intersecting identical elliptic cylinders with identical opposite currents. Another type is the so-called optimum winding, whose configuration is defined by the boundary of the rectangular useful length of a MHD generator and by two step functions. It is shown that there exists an elliptic winding of minimum cross section that will generate a prescribed uniform field. The cross sections of optimal, elliptical, and circular windings are compared for identical magnetic flux densities and identical MHD channel cross sections. V.P.

A73-25346 **Calculation and comparison of the economics of electrochemical fuel cells** (*Berechnung und Vergleich der Wirtschaftlichkeit von elektrochemischen Brennstoffzellen*). F. A. Pohl, H. Böhm, and H. Carl. *Wissenschaftliche Berichte AEG-Telefunken*, vol. 45, no. 3, 1972, p. 141-146. 12 refs. In German. Research supported by the Bundesministerium für Bildung und Wissenschaft.

A73-25976 **Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volumes 1 & 2.** Conference sponsored by ACS, AIAA, AIChE, ANS, ASME, IEEE, and SAE. Hinsdale, Ill., American Nuclear Society, 1972. Vol. 1, 871 p.; vol. 2, 432 p. Price of two volumes, \$40.

Recent developments in energy engineering are described in papers dealing with fusion technology, Brayton-cycle systems, electrochemical power sources, heat-transfer concepts, isotope heat sources, solar cell technology, Rankine-cycle systems, and thermoelectric and thermionic conversion topics. Relevant areas of application include manned and unmanned space missions, biomedical devices, marine systems, and central and compact utility systems. Environmental aspects of energy management are examined along with some advanced new concepts in power generation, conditioning, and distribution.

T.M.

A73-25982 * # **Review of the NASA Brayton System Technology Program.** H. Rothen (NASA, Office of Advanced Research Technology, Washington, D.C.). In: *Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 1.* Hinsdale, Ill., American Nuclear Society, 1972, p. 4-1 to 4-5.

Summary of the research work accomplished on the Brayton space power system during the 1962-1972 period. It is shown that a great amount of Brayton system technology has been developed over this period. In addition, mission users are now seriously considering this system for use in future space missions. M.V.E.

A73-25983 * # **Evaluation testing of a closed Brayton-cycle electrical-power-conversion system.** T. E. Redding, J. M. McGee, and N. C. Luksa (NASA, Manned Spacecraft Center, Houston, Tex.). In: *Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 1.* Hinsdale, Ill., American Nuclear Society, 1972, p. 4-53 to 4-57.

Description of the design and testing of a recuperated, closed Brayton-cycle, electrical power conversion system designated the Brayton Cycle Demonstrator (BCD). The system uses electrical heaters as a heat source, argon as the cycle working fluid, and gas-lubricated foil-type bearings. Objectives of the test program

05 ENERGY CONVERSION

include (1) evaluation of the overall system performance characteristics and influences on spacecraft integration, (2) familiarization of personnel with operational methods, and (3) determination of system flexibility by operating at a number of off-design conditions. Results obtained to date are discussed. T.M.

A73-25984 * # A power and load priority control concept as applied to a Brayton cycle turbo-electric generator. E. L. Kelsey and R. N. Young (NASA, Langley Research Center, Hampton, Va.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 1. Hinsdale, Ill., American Nuclear Society, 1972, p. 4-58 to 4-61.

This paper describes a system to regulate the speed and power output of a Brayton Cycle Power System under varying load. A typical user load profile is applied and a simple load priority and parasitic load is used for system regulation. Power storage is provided by batteries with charge and discharge converters to demonstrate support capability. The breadboard system is tested with the Brayton Cycle Demonstrator at the National Aeronautics and Space Administration, Manned Space Craft Center, Houston, Texas. (Author)

A73-25988 # Performance studies on a rechargeable hydrogen-oxygen fuel cell. W. L. Hughes, R. Ramakumar, and H. J. Allison (Oklahoma State University, Stillwater, Okla.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 1. Hinsdale, Ill., American Nuclear Society, 1972, p. 5-105 to 5-110. 5 refs.

Hydrogen-oxygen fuel cells employing a porous membrane made of calcia stabilized zirconia and sintered nickel electrodes with no noble metal catalysts of any kind have the potential for the development of an economical energy storage system. In this paper, the effect of the porosity of the membrane on the polarization curves of electrolysis and fuel cell modes of operation are investigated experimentally and the results are presented and discussed. In addition, the performance results obtained from one such cell under cyclic charge-discharge mode of operation are summarized. (Author)

A73-26024 # Unmanned reactor-thermoelectric systems for applications in the 1970's. J. H. Van Osdol and J. M. Howard (North American Rockwell Corp., Atomics International Div., Canoga Park, Calif.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 2. Hinsdale, Ill., American Nuclear Society, 1972, p. 13-44 to 13-48. Contract No. AT(04-3)-701.

The purpose of the paper is to describe the results of a preliminary study of reactor-thermoelectric power systems designed for unmanned space applications. These system designs utilize improved thermoelectric converters and a new low-power reactor design. Modifications to the compact lead telluride tubular module have been identified which result in substantial improvements in efficiency. These modifications have been incorporated in the reference module design, and development is under way. The low-power reactor has a design point of 100 kWt at 1200 F for three years. The design incorporates the latest features under development by Atomics International for the Atomic Energy Commission. In addition to typical system performance characteristics, some of the mission-dependent features of reactor-TE systems are presented, including dormant operation, survivability, and spacecraft thermal power requirements. (Author)

A73-28026 # 100 kWe thermionic power system design. A. J. Gietzen and W. G. Homeyer (Gulf General Atomic, Inc., San Diego, Calif.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev.,

September 21-25, 1970. Volume 2. Hinsdale, Ill., American Nuclear Society, 1972, p. 14-19 to 14-26. Contract No. AT(04-3)-167.

An in-core thermionic power system to provide 100 kW net electric power and to meet the shielding requirements of a manned spacecraft is described. The power is produced by thermionic fuel elements similar in design to those now being tested in-pile. Waste heat is removed from the reactor by pumped NaK loops and radiated from heat pipe panels arranged in a cylindrical structure. The electrical output from each pair of fuel elements is processed from about 10 volts dc to about 200 volts dc for transmission to the spacecraft. Factors to be considered in integrating the power system with the Space Base are also discussed. (Author)

A73-26028 # Development of a plutonium-fueled miniature power supply based on thermionic conversion. K. A. Gasper (McDonnell Douglas Astronautics Co., Richland, Wash.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 2. Hinsdale, Ill., American Nuclear Society, 1972, p. 14-40 to 14-44. 5 refs.

Recently a miniature nuclear battery based on thermionic conversion and utilizing a plutonium-238 dioxide heat source has been developed. This power supply consists of a relatively low-temperature thermionic diode operating in the vacuum mode and contained within a thermal housing to make the thermal characteristics of the device compatible with the environment of the application. The thermionic diode is coupled electrically with a dc-dc converter to amplify the fractional-volt output of the power cell to the desired voltage level. Over 20 devices of this type have been fabricated with up to 4.8 mW output from a power cell utilizing 1.3 W(t) of fuel inventory, and 2.7 mW output from a power cell utilizing 0.9 W(t) of fuel inventory. (Author)

A73-26034 # Application of Isotec thermoelectric technology. G. B. Bradshaw and E. J. Steeger (Gulf General Atomic, Inc., San Diego, Calif.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 2. Hinsdale, Ill., American Nuclear Society, 1972, p. 15-26 to 15-30.

Discussion of recent and current work in thermoelectric technology applications to the development of the TRANSIT radioisotope thermoelectric generator. Development testing under the TRANSIT program is shown to have: (1) verified the adaptability of Isotec panels to new configurations, (2) demonstrated electrical performance characteristics consistent with predictions, and (3) evaluated the structural integrity and thermal efficiency of the design. M.V.E.

A73-27321 # Qualitative analysis of MHD energy conversion efficiency (Kachestvennyi analiz effektivnosti MGD-preobrazovaniia energii). V. Iu. Baranov, D. D. Maliuta, V. P. Panchenko, and F. R. Ulinich (Akademiia Nauk SSSR, Institut Atomnoi Energii, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 11, Jan.-Feb. 1973, p. 167-173. In Russian.

A method is proposed for solving the system of one-dimensional differential equations describing the gas flow in the channel of a Faraday-type MHD generator with ideally segmented electrodes. The convergence efficiency of the generator is determined as a function of the generator length and the load factor. The influence of the channel shape and the inlet Mach number on the conversion factor is examined, and the range of optimal parameters is determined. The energy conversion efficiency of a Faraday-type generator with solid electrodes is discussed. V.P.

A73-28071 Nonequilibrium ionization in magnetohydrodynamic conversion generators (Sur l'ionisation hors d'équilibre dans les générateurs de conversion magnétohydrodynamique). J.-P.

Caressa (Aix-Marseille, Université, Marseille, France). *Académie des Sciences (Paris), Comptes Rendus, Série A - Sciences Mathématiques*, vol. 276, no. 12, Mar. 19, 1973, p. 883-886. 6 refs. In French.

Consideration of possible causes for the low Hall electrostatic field value observed in experimental MHD converters. The possibility is shown to explain this low field value by nonequilibrium ionization, without having to resort to the generally invoked ionization instability mechanisms. M.V.E.

A73-29681 Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Symposium sponsored by the U.S. Army. Red Bank, N.J., PSC Publications Committee, 1972. 204 p. \$20.

Development efforts, design features, materials properties, and performance evaluations are described for primary and secondary battery systems, thermal energy conversion devices, solar cell arrays, and fuel cells. Topics considered include battery degradation mechanisms, charging and charge-maintenance systems, electric power control and conditioning circuits, isotopic power systems, fossil-fuel heated thermionic diodes, an organic Rankine cycle power system, solar cell efficiency improvements, and advanced spacecraft fuel cell systems.

Individual items are announced in this issue.

T.M.

A73-29698 Optimizing power efficiency of hydrazine-oxygen fuel cells. H. B. Urbach, D. E. Icenhauer, and R. J. Bowen (U.S. Naval Ship Research and Development Center, Annapolis, Md.). In: Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. Red Bank, N.J., PSC Publications Committee, 1972, p. 182-185. 15 refs. Navy-supported research.

Tests to determine the optimum operation conditions of hydrazine-oxygen cells indicate that their coulombic efficiency is a direct function of current density and an inverse function of hydrazine concentration and temperature. The voltage efficiency, in contrast, is a direct function of temperature and an inverse function of operating time and current density. Power efficiencies above 40% were observed in single cells at 60 C. V.Z.

A73-30950 # Utilization of thermosiphons in the construction of thermoelectric devices (Ispol'zovanie termosifonov v termoelektricheskom priborostroenii). E. A. Kolenko and M. G. Verdiev (Akademiya Nauk SSSR, Institut Poluprovodnikov, Leningrad, USSR). *Geliotekhnika*, no. 1, 1973, p. 10-12. In Russian.

The principles of operation of cooling systems employing an evaporation-condensation-evaporation cycle are examined. The effectiveness of such heat exchangers is analyzed, and the advantages which accrue from the use of such systems in thermoelectric devices are pointed out. V.P.

A73-31250 Ceramics in automotive gas turbines. A. F. McLean (Ford Motor Co., Dearborn, Mich.). (*American Ceramic Society, Annual Meeting, 7th, Washington, D.C., May 9, 1972.*) *American Ceramic Society Bulletin*, vol. 52, May 1973, p. 464-466, 482. Research supported by the Ford Motor Co., ARPA, and U. S. Army.

Substantial improvements in specific fuel and air consumption can be obtained by increasing the turbine inlet temperature from 1800 to 2500 F. However, the employment of the presently used nickel-chrome superalloys in small gas turbines where blade cooling is impractical limits the maximum turbine inlet gas temperatures to about 1900 F. The replacement of superalloys with ceramics offers the possibility to overcome this temperature barrier. In a screening program for selecting promising materials silicon nitride and silicon carbide were selected. Current effort is aimed at continuing to develop durability of stationary ceramic components in engine testing and to develop practical methods to fabricate complex shaped turbine rotors from ceramic materials. G.R.

A73-32194 * # Nuclear air cushion vehicles. J. L. Anderson (NASA, Lewis Research Center, Cleveland, Ohio). *American Ordnance Association, High-Performance Ships Symposium, Washington, D.C., May 8, 9, 1973, Paper*. 39 p. 42 refs.

This paper serves several functions. It identifies the 'state-of-the-art' of the still-conceptual nuclear air cushion vehicle, particularly the nuclear powerplant. Using mission studies and cost estimates, the report describes some of the advantages of nuclear power for large air cushion vehicles. The paper also summarizes the technology studies on mobile nuclear powerplants and conceptual ACV systems/missions studies that have been performed at NASA Lewis Research Center. (Author)

A73-34111 Applications of superconductivity. B. B. Goodman (British Oxygen Co., Ltd., London, England). In: Trends in physics; General Conference, 2nd, Wiesbaden, West Germany, October 3-6, 1972, Lectures. Petit-Lancy, Switzerland, European Physical Society, 1973, p. 67-94. 79 refs.

While, in the past, numerous applications of superconductivity have been suggested, those which now appear capable of competing effectively with other technologies are grouped into just three main areas. By far the most important at present is in the use of Type 2 superconductors to produce large dc (or slowly time dependent) magnetic fields for use in research, in novel types of electrical machinery and possibly in magnetically levitated trains. In this area, the advantage of using superconductors appears to be greatest for large scale projects. Secondly, superconductivity is of interest in two types of application which do not specifically require high fields, linear accelerators and power cables. Finally, the Josephson effect is leading to the development of a rich harvest of electronic devices with unique properties of sensitivity and accuracy. (Author)

A73-34447 Small engines - Big business /1972 Halford Memorial Lecture/. J. E. B. Perkins (Rolls-Royce, Ltd., Small Engine Div., Derby, England). (*Royal Aeronautical Society and British Helicopter Advisory Board, Symposium on Heliports, London, England, Mar. 8, 1972.*) *Aeronautical Journal*, vol. 77, May 1973, p. 240-248.

Small gas turbines, defined as those in the power range up to around 3000 shp and 4000 lb thrust, i.e., engines for general aviation, corporate, and executive aircraft, and limited trainer operations and helicopters are discussed. The background of the small engine business in market and technical terms is developed to highlight a number of features of the small engine business as it exists today. The technical progress made to date is reviewed, examining aspects of fuel consumption, power, weight, and price. Some future market trends for small engines, and the likely solutions in terms of supporting technology are discussed, and the ways in which the industry's structure might develop to support profitably this part of the business are examined. F.R.L.

A73-34694 Refanned commercial gas turbine engines. G. M. McRae (United Aircraft Corp., Pratt and Whitney Aircraft Div., East Hartford, Conn.). *Society of Automotive Engineers, Air Transportation Meeting, Miami, Fla., Apr. 24-26, 1973, Paper 730346*. 8 p. Members, \$1.25; nonmembers, \$2.00.

A NASA sponsored program to develop noise-reduction modifications for the JT3D and JT8D engines was initiated in August 1972. New higher flow single-stage fans are attractive and result in higher bypass ratios with improved thrust and fuel consumption and reduced jet velocities. Fly-over noise reductions as great as 20 EPNdB are shown for the modified engines with nacelle treatment. Engine certification can be completed and production hardware for fleet retrofit or new aircraft can be provided by late 1975. (Author)

A73-35379 Lasers for fusion. D. H. Gill (California, University, Los Alamos, N. Mex.). In: Annual Southwestern Conference and Exhibition, 25th, Houston, Tex., April 4-8, 1973, Record. (A73-35357 17-07) New York, Institute of Electrical and Electronics

05 ENERGY CONVERSION

Engineers, Inc., 1973, p. 430-437. 30 refs. AEC-sponsored research.

A brief review of the theory of absorption of laser light by plasmas and of the necessary requirements for the production of controlled thermonuclear fusion is given. The implications of this theory in regard to the requirements on the laser to be used for fusion are discussed. The three types of lasers being considered for use (electrically pumped gas lasers, chemical, and solid state lasers) are each described with discussion of their relative advantages and disadvantages. The Nd:glass system is described in greater detail since that system is now being used to study the basic light-matter interactions at a number of laboratories around the world. Finally, mention is made of the present status of, and future plans for, large laser systems now being built at some of those laboratories. (Author)

A73-36681 Improved technology for multiwatt radioisotope heater units. A. W. Barsell, R. B. Goranson, and P. R. Clements (Donald W. Douglas Laboratories, Richland, Wash.). *Nuclear Technology*, vol. 19, Aug. 1973, p. 117-125. 9 refs. Contract No. AT(45-1)-2166.

The approach considered optimizes radioisotope heater units for long-life protection against credible accident environments, while serving the largest practical number of missions at minimum weight and maximum safety. Safety and lower long-range qualification costs are increased through the use of an optimized design for multiple applications. Design and safety criteria are discussed together with questions of materials development, design parametrics, concept comparisons, and development tests. G.R.

A73-38310 Engineering aspects of magnetohydrodynamics; Proceedings of the Thirteenth Symposium, Stanford University, Stanford, Calif., March 26-28, 1973. Symposium sponsored by Stanford University. Edited by M. Mitchner. University, Miss., University of Mississippi, 1973. 366 p. \$15.

Calculation and measurement of MHD generator boundary-layer velocity profiles, stability of a nonequilibrium helium-cesium MHD plasma in a regime of fully ionized seed, and thrust stand performance measurements of a lithium fueled applied field MPD arcjet are among the topics covered in papers concerned with plasma flows and instabilities. Other areas covered include liquid-metal generators, system and design studies, and pollution and combustion plasma properties.

M.V.E.

A73-38311 * # NaK-nitrogen liquid metal MHD converter tests at 30 kW. D. J. Cerini (California Institute of Technology, Jet Propulsion Laboratory, Pasadena, Calif.). In: Engineering aspects of magnetohydrodynamics; Proceedings of the Thirteenth Symposium, Stanford, Calif., March 26-28, 1973. University, Miss., University of Mississippi, 1973, p. III.2.1-III.2.7. 10 refs. Contract No. NAS7-100.

Description of the tests performed and test results obtained in an experiment where a NaK-nitrogen liquid metal MHD converter was operated over a range of nozzle inlet pressures of 100 to 165 N per sq cm, NaK flow rates of 46 to 72 kg/sec, and nitrogen flow rates of 3.4 to 3.8 kg/sec. The test results indicate: (1) smooth and stable operation, (2) absence of unexpected electrical or flow losses, and (3) possibility of operation with the expected full power output of 30 kW. M.V.E.

A73-38386 Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum. Conference sponsored by AIAA, AIChE, ANS, ASME, IEEE, SAE, and ACS. New York, American Institute of Aeronautics and Astronautics, Inc., 1973. Proceedings, 854 p.; Addendum, 180 p. Members, \$50.; nonmembers, \$60.

The development of energy conversion systems is depicted in papers dealing with the operation, design, performance, materials,

testing, and reliability of specific new and improved system concepts. Major topics covered include radioisotope thermoelectric generators, electrochemical power systems, solar power, biomedical power sources, nuclear energy, hydrogen fuel developments, Stirling cycle engines, aerospace power systems, and urban energy sources. Devices examined cover the wet Brayton cycle engine, Rankine cycle engines, the Wankel rotary engine, fuel cells, batteries, gas turbines, nuclear reactors, and utility systems for urban needs.

T.M.

A73-38389 # Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources. P. E. Eggers and J. L. Ridihalgh (Battelle Columbus Laboratories, Columbus, Ohio). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 13-20. 12 refs.

A73-38398 # High power density hydrazine fuel cells. D. E. Icenhower and H. B. Urbach (U.S. Naval Material Command, Ship Research and Development Center, Annapolis, Md.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 67-71. 7 refs.

A hydrazine-oxygen fuel cell was operated under moderate conditions of temperature and concentration at power densities up to 600 watts per square foot (1000 amperes per square foot at 0.6 volt). At this output, a power efficiency of 32% was obtained at 70 C at less than molar hydrazine concentration. Power efficiencies exceeding 48% were obtained over a power density range from 40 to 200 watts per square foot by optimal matching of the temperature (5 to 80 C) and hydrazine concentration (0.1 to 1.0 molar) to the electrical load. The three major components of cell polarization were examined. Critical resistance losses were minimized by use of a .010-inch asbestos matrix which was more than adequate to prevent leakage of oxygen to the anode at moderate differential pressures.

(Author)

A73-38403 # High energy density silver-hydrogen cells for space and terrestrial applications. R. J. Haas and D. C. Briggs (Philco-Ford Corp., Palo Alto, Calif.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 116-120.

Description of the performance and design characteristics of recently developed silver-hydrogen cells. The first phase of this program encompassed design and electrical cycling of single and multiple plate cells. Based on the high rate (2C) long cycle life performance demonstrated by these cells, a series of production type 4.0 and 20.0 ampere-hour cells were designed, constructed, and electrically characterized. The basic cell design consists of rectangular silver and catalyzed fuel cell plates alternately stacked in a hermetically sealed prismatic container. Electrical connection is provided by ceramic-metal seals. Heat is dissipated from the cell core through the flat container surfaces to intercostal thermal shunts, minimizing temperature gradients within the cell. In general, the performance indicates that this design is capable of producing energy densities in excess of 60 watt hours per pound. (Author)

A73-38410 # Thermoelectric nuclear batteries. L. C. Olsen and A. Bennett (Donald W. Douglas Laboratories, Richland, Wash.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings.

New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 461-467. Research supported by the McDonnell Douglas Astronautics Independent Research and Development Program.

An approach to building thermoelectric nuclear batteries in the milliwatt power range combines bismuth-telluride thermopiles with plutonia fuel capsules. Power produced by the battery is coupled to a dc-dc converter to increase the output voltage. The program involved development of bismuth-telluride thermopiles, as well as processing techniques for vacuum-packaged batteries and dc-dc converters. Thermopiles utilizing indium-bismuth solder which melts at 117 C were developed. First prototypes used Xe as the insulator between the outer can and the fuel capsule; one such battery fueled with 1.3 W (thermal) of Pu-238 produced 8 mW of conditioned power, for 0.6% system efficiency. Current Model NT-50 batteries fueled with 1.5 W (thermal) of Pu-238 produce 22 mW of conditioned power, for 1.5% system efficiency; these batteries use improved bismuth-telluride thermopiles and vacuum package. (Author)

A73-38411 * # Exploratory study of several advanced nuclear-MHD power plant systems. J. R. Williams, J. D. Clement (Georgia Institute of Technology, Atlanta, Ga.), R. J. Rosa (Georgia Institute of Technology, Atlanta, Ga.; Avco Everett Research Laboratory, Everett, Mass.), and Y. Y. Yang. In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 558-565. 21 refs. Grant No. NGR-11-002-145.

In order for efficient multimewatt closed cycle nuclear-MHD systems to become practical, long-life gas cooled reactors with exit temperatures of about 2500 K or higher must be developed. Four types of nuclear reactors which have the potential of achieving this goal are the NERVA-type solid core reactor, the colloid core (rotating fluidized bed) reactor, the 'light bulb' gas core reactor, and the 'coaxial flow' gas core reactor. Research programs aimed at developing these reactors have progressed rapidly in recent years so that prototype power reactors could be operating by 1980. Three types of power plant systems which use these reactors have been analyzed to determine the operating characteristics, critical parameters and performance of these power plants. Overall thermal efficiencies as high as 80% are projected, using an MHD turbine-compressor cycle with steam bottoming, and slightly lower efficiencies are projected for an MHD motor-compressor cycle. (Author)

A73-38412 * # The Satellite Nuclear Power Station - An option for future power generation. J. R. Williams and J. D. Clement (Georgia Institute of Technology, Atlanta, Ga.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 566-573. 22 refs. Grant No. NGR-11-002-145.

A new concept in nuclear power generation is being explored which essentially eliminates major objections to nuclear power. The Satellite Nuclear Power Station, remotely operated in synchronous orbit, would transmit power safely to the ground by a microwave beam. Fuel reprocessing would take place in space and no radioactive materials would ever be returned to earth. Even the worst possible accident to such a plant should have negligible effect on the earth. An exploratory study of a satellite nuclear power station to provide 10,000 MWe to the earth has shown that the system could weigh about 20 million pounds and cost less than \$1000/KWe. An advanced breeder reactor operating with an MHD power cycle could achieve an efficiency of about 50% with a 1100 K radiator temperature. If a hydrogen moderated gas core reactor is used, its breeding ratio of 1.10 would result in a fuel doubling time of a few years. A rotating fluidized bed or NERVA type reactor might also be used. The efficiency of power transmission from synchronous orbit would range from 70% to 80%. (Author)

A73-38414 * # Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range. J. E. Boretz (TRW Systems Group, Redondo Beach, Calif.). In: Intersociety Energy Conversion

Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 601-608.

An in-house study was conducted to evaluate isotope organic Rankine cycle electric power systems in the 150 to 1500-W power range. Both conventional (turbogenerator only) and 'hybrid' (cascaded thermoelectrics used in a 'topping' manner) were considered. The working fluids, thermoelectric elements, and cycle conditions considered are reviewed. In addition, the performance characteristics for both the 'turbogenerator only' and 'hybrid' systems are summarized. The static conversion system is designed to operate in a 'topping' or 'binary' mode with respect to the dynamic energy conversion system. Thus after generating a portion of the total system electric power output in the thermoelectric elements, the heat rejected from this system provides the heat input to the boiler of the organic Rankine cycle energy conversion system. The electric power output from the thermoelectric stage is then combined with the output power from the turbogenerator unit. (Author)

A73-38418 * # The multi-hundred watt RTG - Technology background and flight systems program. A. J. Arker and R. E. Schafer (General Electric Co., Philadelphia, Pa.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 1-14.

A summary system description and program schedule and status are presented for the development of the multihundred watt radioisotope thermoelectric generator (MHW-RTG). Also described are the major technology developments undertaken in support of the thermoelectric converters and isotope heat sources which form the RTG. The MHW-RTG modules generate 150 W(e), each utilizing a 2400 W(t) Pu-238 heat source and SiGe thermocouples. The prime structure is a beryllium case, and the thermal insulation is alternate layers of molybdenum foil and quartz cloth. Other hardware in the system includes loading and assembly stations, shipping and storage containers, electric heat sources, test consoles, and other ancillary equipment. (Author)

A73-38419 * # MHW converter design and performance summary. C. H. Bixler, V. F. Haley, and C. E. Kelly (General Electric Co., Philadelphia, Pa.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 15-21. Contract No. AT(29-2)-2831.

Description of the multihundred watt (MHW) converter design, including a summary of the operating characteristics for on-pad and orbital conditions and an illustration of the radioisotope thermoelectric generator (RTG) configurations for the LES 8/9 and Mariner J and S applications. The generator uses a 2400-W Pu-238 heat source and has been configured to deliver 150 W of power at 30 V at the beginning of mission with a requirement to produce 125 W after five years of orbital operation. The converter consists of 312 silicon-germanium thermoelectrics and a multilayer molybdenum foil astroquartz insulation system housed within a sealed beryllium outer shell which serves as the RTG primary structure and external waste heat radiator. An inert cover gas is provided to protect the foil insulation during ground operations and is vented to space after launch. (Author)

A73-38422 * # Performance models for the MHW converter. C. E. Kelly, J. A. Loffreda (General Electric Co., Philadelphia, Pa.), and R. Lorentzen (RCA, Harrison, N.J.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. Addendum. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 37-46.

05 ENERGY CONVERSION

The multihundred watt (MHW) converter is a 150-W(e) 30-V power supply designed for a space application. The energy source is 2400 watts of Pu-238. Three hundred and twelve silicon-germanium thermoelectric couples convert the heat energy at an initial system efficiency of 6.5%. A molybdenum/astroquartz multifoil insulation system is used to minimize heat losses. A series of tests are in progress to assist in the understanding of the temperature and time dependence of the material property changes. A computer model of the MHW converter is being developed to assist in the projection of long-term performance. Results of tests and modeling to date are discussed and the expected band of performance at five years is shown as a function of various extrapolation models and as a function of the beginning of mission hot junction temperature.

(Author)

A73-39618 # Experimental investigation of the characteristics of a nonequilibrium MHD generator (Eksperimental'noe issledovanie kharakteristik neravnovesnogo MGD-generatora). A. E. Buznikov, V. E. Vanin, and V. V. Kirillov (Akademiia Nauk SSSR, Nauchno-Issledovatel'skii Institut Vysokikh Temperatur, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 11, May-June 1973, p. 622-631. 23 refs. In Russian.

Results of experimental studies of a nonequilibrium MHD generator operating with a potassium-seeded argon plasma. Test measurements were performed at Hall numbers ranging from 1.5 to 25, electron temperatures of 1800 to 2800 K, electron-to-neutral particle temperature ratios of 1.1 to 1.8, and various values of relative wall temperature. It is shown that in addition to the influence of ionizational instability, the characteristics of a nonequilibrium MHD generator are substantially affected by imperfections of electrical insulation in the channel and by inhomogeneities of nonequilibrium-plasma conductivity in layers near the electrodes.

T.M.

A73-39619 # Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition (Eksperimental'noe issledovanie raboty poristogo elektroda MGD-preobrazovatelia pri vduve argona s prisadkoi kalii). V. O. German, Iu. P. Kukota, G. A. Liubimov, B. V. Parfenov, I. S. Poltavtseva, V. M. Sleptsov, and G. M. Shchegolev (Akademiia Nauk Ukrainsskoi SSR, Institut Tekhnicheskoi Teplofiziki i Institut Problem Materialovedeniia, Kiev, Ukrainian SSR; Moskovskii Gosudarstvennyi Universitet, Moscow, USSR). *Teplotfizika Vysokikh Temperatur*, vol. 11, May-June 1973, p. 632-638. 7 refs. In Russian.

A73-41676 Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion. T. A. Oliphant, F. L. Ribe (California, University, Los Alamos, N. Mex.), and T. A. Coultas (Argonne National Laboratory, Argonne, Ill.). *Nuclear Fusion*, vol. 13, Aug. 1973, p. 529-532. AEC-sponsored research.

The useful work output from the magnetic compression, decompression, and alpha-particle energy deposition of a single-cycle D-T theta-pinch reactor is considered. The intrinsic thermodynamic efficiency of the direct conversion cycle from alpha-particle energy to work is 62%. The direct-conversion output work is available to the reactor system at essentially 100% efficiency, and has an appreciable effect on the circulating power fraction and plant efficiency. M.V.E.

A73-41876 # Physical bases of thermionic energy conversion (Fizicheskie osnovy termoemissionnogo preobrazovaniia energii). I. P. Stakhanov, A. S. Stepanov, V. P. Pashchenko, and Iu. K. Gus'kov. Moscow, Atomizdat, 1973. 375 p. 294 refs. In Russian.

A study is made of the physical processes occurring in a low-temperature weakly ionized plasma. The structure of the electrode layer in the plasma is discussed, as well as the mechanism of ionization of atoms in the discharge and problems concerning the

occurrence and stability of vibrations in a weakly ionized plasma. Methods of calculating the current-voltage characteristics of a gas discharge are described, and the calculation of the kinetic coefficients of a low-temperature three-component plasma in a magnetic field is discussed. Particular attention is paid to a study of a low-voltage arc discharge. The effect of various additives to cesium on the operation of a thermionic energy converter is also considered.

A.B.K.

A73-42906 High-efficiency converter and battery charger for an RTG power source. R. L. Donovan (Martin Marietta Aerospace, Denver, Colo.). In: Power Electronics Specialists Conference, Pasadena, Calif., June 11-13, 1973, Record.

New York, Institute of Electrical and Electronics Engineers, Inc., 1973, p. 46-57. 6 refs.

Spacecraft power systems utilizing radioisotope thermoelectric generators (RTGs) as primary power sources present an uncommon set of requirements and limitations for interfacing dc-to-dc converters. A converter configuration is presented that complements these RTG characteristics. The circuit is a variation of the basic flyback regulator modified to provide input regulation. The converter has two isolated outputs. One output provides power directly to the spacecraft equipment, while the second is used for battery charging. Design problems addressed are noise generation in long cable lengths between the RTG source and the converter, regulation of the converter input to obtain maximum power transfer from the RTG to the equipment, and provision for two converter outputs while maintaining high efficiency with a simple design implementation. The design of a converter and battery charger used on the Viking Lander Capsule is presented as an illustration. (Author)

N68-10050*# General Electric Co., Philadelphia, Pa. Missile and Space Div.

COMPARISON OF LOAD BEARING AND NON-LOAD BEARING RADIATORS FOR NUCLEAR RANKINE SYSTEMS

R. D. Cockfield 6 May 1967 98 p refs

(Contract NASw-1449)

(NASA-CR-72307; GE-ANSO-6300-203) CFSTI: HC \$3.00/MF \$0.65 CSCL 18N

A comparison is made between load bearing radiators in a conical configuration, and nonload bearing radiators in a flat panel configuration, for a nuclear potassium Rankine powerplant. For a typical unmanned interplanetary probe mission the load bearing radiator showed a payload advantage of four percent at a power level of 300 kWe, and an advantage of thirty percent at 1200 kWe. The comparison shows that the nonload bearing radiator does not achieve the payload advantage for interplanetary missions that might be anticipated by virtue of its ability to dispose of launch structure.

Author

N68-10758# Aeroprojects, Inc., West Chester, Pa.

APPLICATIONS OF ULTRASONIC ENERGY: ULTRASONIC INSTRUMENTATION FOR NUCLEAR APPLICATIONS Bimonthly Progress Report, Jun. 1-Jul. 31, 1967

Aug. 1967 11 p ref

(Contract AT(30-1)-3622)

(NYO-3622-10; BMPR-35) CFSTI: HC \$3.00/MF \$0.65

Development of ultrasonic instrumentation for incipient boiling detection in liquid metals or fused salts is outlined. Flow rate experiments using an ultrasonic flowmeter are presented. NSA

N68-10892# Institut für Plasmaphysik G.m.b.H., Garching (West Germany)

THE ELECTRICAL CONDUCTIVITY IN ARGON POTASSIUM AND HELIUM POTASSIUM PLASMAS WITH ELEVATED ELECTRON TEMPERATURES IN CROSSED ELECTRIC AND MAGNETIC FIELDS

G. Bräderlow and R. Hodgson Sep. 1967 30 p refs

(IPP-3/59) CFSTI: \$3.00

Methods and results of measurements of the tensor conductivity and electron temperatures in argon potassium and helium potassium plasmas with elevated electron temperatures under MHD generator conditions are described. Electrode and wall effects that would make the measurements more difficult to interpret have been eliminated. Calculations predict that the scalar electrical conductivity should drop slightly with increasing magnetic field strength. However, the measured effective scalar conductivity was less than the theoretically predicted value. The discrepancy is apparently due to instabilities. These instabilities were investigated. At current densities and field strength values at which instabilities were observed, the effective Hall coefficient has been found to be nearly independent of the magnetic field strength. The measurements have shown that the efficiency of a noble gas MHD generator is adversely affected not only by the decrease of the scalar conductivity in a magnetic field, but also by the onset of instabilities. Author

N68-10967# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.

ELECTRICAL COMPONENT TECHNOLOGY FOR 0.25 TO 10.0 MEGAWATT SPACE POWER SYSTEMS, DESIGN STUDY Quarterly Technical Progress Report, Mar. 1, 1966-May 31, 1967

A. E. King, ed. 31 May 1967 93 p
(Contract AT(04-3)-679)

(SAN-679-3; QTPR-3) CFSTI: HC\$3.00/MF\$0.65

Parametric studies to determine minimum system weight as a function of electrical component rating, voltage, frequency, and speed are presented on ac generators, ac motors, power conditioning, and power distribution equipment for 0.25 to 10.0 megawatt space nuclear electric power plants utilizing the Rankine conversion cycle. The power conditioning and distribution equipment includes transformers, rectifiers, frequency changers, contactors, and transmission lines. Concluding parametric data are presented for the electrical system components listed. Electrical power systems are presented to illustrate electrical load break-down on probable missions requiring 0.25 to 10.0 megawatts of power. Experiments to verify analytical techniques for inductor generator designs typical of high-power, high-speed, high-frequency, high temperature applications are presented. Author (NSA)

N68-11030* Allis-Chalmers Mfg. Co., Milwaukee, Wis. Research Div.

RESEARCH AND DEVELOPMENT ON FUEL CELL SYSTEMS Quarterly Progress Report, Jan. 1-Mar. 31, 1966

31 Mar. 1967 162 p
(Contract NAS8-2696)

(NASA-CR-90210; QPR-7) CSCL 10A

Details are presented on the work completed during this reporting period. Research and technological activities are discussed for the following areas: anode catalyst density, matrix water transport rate tests, reactant impurities tests, high and room temperature storage, high-loading electrode test, manifold test, KOH flush of expended fuel cell, and theoretical analysis of shell type heat exchange. Tests of the thermal mockup and advanced thermal design system are described, and it is felt that the system demonstrated the ability to remove rejected heat up to an equivalent fuel cell load of 2.5 kW with a coolant inlet temperature of 100°F and a flow rate of 90 lb/hr. Results of the 2.0 kW fuel cell power system test models are discussed. N.E.N.

N68-11139 Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

HIGH TEMPERATURE ENERGY SYSTEMS WITH PLASMA

REACTORS AND INDUCTIVE MAGNETOPLASMA DYNAMIC CONVERTERS [HOCHTEMPERATUR-ENERGIESYSTEME UNTER VERWENDUNG VON PLASMA REAKTOREN UND INDUKTIVEN MAGNETOPLASMA DYNAMISCHEN WANDLERN]

W. Peschka Sep. 1967 25 p refs In GERMAN; ENGLISH summary

(DLR-FB-67-59) CFSTI: \$3.00

The purpose of this paper is to investigate possible future power generating equipment which operates with high temperature plasma as a working medium and subsequently with high power density. This temperature range requires reactors whose nuclear fuel is in the plasma (fission or fusion reactors) coupled to magnetoplasmadynamic generators acting as energy converters. Electrodeless MPD-Generators with all their advantages can be successfully employed. The technological ramifications arising from the application of these high temperatures with respect to the reactors and the MPD-Generators as well as to the heat release equipment are discussed. Author

N68-11382# Minnesota Mining and Mfg. Co., St. Paul, Minn.

SNAP-21 PROGRAM. PHASE 2: DEEP SEA RADIOISOTOPE-FUELED THERMOELECTRIC GENERATOR POWER SUPPLY SYSTEM Quarterly Report, Apr. 1-Jun. 30, 1967 1967

F. K. Fox Jul. 1967 139 p
(Contract AT(30-1)-3691)

(MMM-3691-20; QR-4) CFSTI: HC\$3.00/MF\$0.65

Progress is reported on the SNAP-21 system design study. The generator A10D-z was completely assembled and found to have some fiberglass insulation sleeving short circuits which were corrected. Weld closures and insulation system were completed. Radiation effectiveness of the biological shield was determined using a 200 W ⁹⁰SrO source. 214 couples including both the instrumented types and those with output tap assemblies were fabricated. Development work is continuing to improve the physical strength of the bond of the N- and P-leg couples during bonding through improved fabrication techniques. Test plans for compatibility testing of multi-layer insulation were completed, the test fixture was designed, and 500 of the 2000 hrs of testing were accomplished. Tests concerning the relationship between degradation in the resistance of the bias section of the thermopile and the starting characteristics of the power conditioner showed that the power conditioner operating at the rated load with a degradation of 2:1 in the thermopile bias section will not inhibit starting under normal operating load. Test sections for the electrically heated fuel capsules, laboratory corrosion specimens and the galvanic and marine fouling system components were fabricated. The results of ultrasonic tests on the first weld development closures on fuel capsules were evaluated. Some cold end heat transfer tests were completed. Conceptual drawings of the 20 W system were started. An updated design envelope for the 20 W high vacuum thermal insulation system was prepared. The thermoelectric leg geometry was determined to establish the size of the generator. NSA

N68-11503# Monsanto Research Corp., Everett, Mass. Boston Labs.

FIVE-KILOWATT HYDRAZINE/AIR FUEL CELL MODULES Final Technical Report, 9 Apr. 1965-24 Jul. 1966

Robert E. Salathe and Peter L. Terry 10 Jun. 1967 35 p
(Contracts DA-44-009-AMC-983(T))

(MRB4026F; AD-659813)

Fuel cells based on an initial conceptual design for a 5-kilowatt N2H4/KOH/air fuel cell were constructed and operated. A development program was conducted in which factors causing operational difficulties were identified, and appropriate modifications of the design and choice of materials were then made. TAB

05 ENERGY CONVERSION

N68-11664 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE INTEGRAL CHARACTERISTICS OF A MAGNETOHYDRODYNAMIC GENERATOR WITH TWO PAIRS OF FINITE-LENGTH ELECTRODES

Ye. K. Kholshchevnikova *In its J. of Appl. Mech. and Tech. Phys.* 19 Apr. 1967 p 25-38 refs

The current distribution in an MHD channel with two pairs of finite-length electrodes along its walls separated by isolated sections was calculated. The potential difference between each pair of electrodes may vary. The channel is assumed to extend to infinity in the x direction with width 2δ in the y direction. The length of each electrode is l and the insulator 2λ . The magnetic Reynolds number is assumed to be small, and all induced currents are neglected. The magnetic field is given by $\vec{B} = (0, 0, -B_0)$ and the velocity field by $\vec{V} = [V(y), 0, 0]$, and σ is constant throughout the channel. It is further assumed that the current is symmetric relative to the x axis, and consequently the flow field is mapped from the z plane onto the τ plane. The currents I_1 and I_2 are defined and obtained in nondimensional forms. Several special cases are considered: (1) l and 2δ fixed and the insulation length approaching zero; (2) the effects of external loads on I_1 , I_2 , and the generator efficiency; and (3) the effect of channel geometry on I_1 , I_2 , and I .

K.W.

N68-11928# Atomics International, Canoga Park, Calif. NON-EQUILIBRIUM IONIZATION IN A POTASSIUM GAS MHD DEVICE Final Report

Charles A. Guderjahn Sep. 1967 58 p refs
(Contract AF 49(638)-01721)

(AI-67-138; AFOSR-67-2176; AD-660882)

A theoretical and experimental study of the plasma properties and fluid mechanisms of an annular magnetohydrodynamic generator operated in the Hall mode and driven by potassium gas is described. Nonequilibrium ionization is observed but is accompanied by concentration of current into streamers in the generator and reduction in the expected Hall voltage. As a consequence, the generator efficiency is reduced to zero.

Author (TAB)

N68-12191 Atomics International, Canoga Park, Calif. Space Systems Dept.

NUCLEAR SPACE POWER SYSTEMS: REACTORS, CONVERSION EQUIPMENT, AND POWER SYSTEMS TECHNOLOGY

H. M. Dieckamp *In AGARD Nucl., Thermal and Elec. Rocket Propulsion* 1967 p 361-504 refs

The state of the art of nuclear power systems is reviewed, and the specific objectives of the SNAP program are delineated. Reactor heat sources are described in terms of nuclear fission, the chain reaction, and reactor design, and heat rejection equations are derived. Specific reactor requirements for a space power application are established, and a reactor-power conversion combination is selected. This is done by assessing the three major subsystems for nuclear space power plants: the reactor heat source, the power conversion cycle, and the waste heat radiator. The Rankine and Brayton cycles, thermoelectric, and thermionic power conversion systems are described, and the performance capabilities and limitations of each concept are discussed. The criteria for vehicle integration are defined. Design details and operational test data are given on the SNAP hydride reactor, SNAP 10A, and SNAP 2.

M.G.J.

N68-12477# Jackson and Moreland, Inc., Boston, Mass. REVIEW AND EVALUATION OF PROJECT FUEL CELL

H. F. White Dec. 1966 105 p

(Contract DI-14-01-001-500)

(OCR-17; PB-173765) CFSTI: HC\$3.00/MF\$0.65

Progress is reported in the development of a high efficiency, coal oxidation, solid electrolyte fuel cell. The technical potential of the fuel cell is evaluated, and a research program required to establish commercial feasibility is projected. Cost estimates are prepared for the research program including equipment, data collection, and evaluation of each work phase. The first commercial use of the fuel cell power system is projected, and a potential application is described which includes capital investment, operating costs, efficiency, and power cost. A compilation of report abstracts that were generated as a result of the study is included. C.T.C.

N68-12691# Argonne National Lab., Ill.

ANION-EXCHANGE BEHAVIOR OF LIGHT RARE EARTHS IN AQUEOUS METHANOL SOLUTIONS CONTAINING NEUTRAL NITRATES. 2: MACRO-MICRO SEPARATIONS

F. Molnar, A. Horvath, and V. A. Khalkin Jul. 1967 9 p refs
Transl. into ENGLISH from Brennst.-Waerme-Kraft (Germany), v. 17, 1965 p 13-16

(ANL-TRANS-508) CFSTI: HC\$3.00/MF\$0.65

It has often been proposed that a liquid metal stream driven by a vapor stream of the same metal to high velocity be used for the application in MHD generators. The theoretical possibility of such an ejector was investigated from thermodynamical and fluid mechanical view points. The results indicate that the maximum of the attainable thermal efficiency is very low.

Author (NSA)

N68-13094# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STATUS AND PERSPECTIVES OF DEVELOPING MAGNETOHYDRODYNAMICS GENERATORS [SOSTOYANIYE I PERSPEKTIVY RAZVITIYA MAGNITOGIDRODINAMICHESKIKH GENERATOROV]

A. I. Moskutin 18 Apr. 1967 42 p refs
Transl. into ENGLISH from Akad. Nauk SSSR. Energ. Inst. Vopr. Razvitiya Energ. (USSR), 1964 p 56-79

(FTD-HT-66-378; AD-661771)

As is evident from the explained matter, work on MGD generators in world technology has sharply progressed in recent years. According to conduction generators with thermal equilibrium ionization, in the most theoretically and experimentally processed, powers of experimental samples were obtained of up to 1350 kw. Probably, in the relatively close future, experimental stations of thermal power will be built of the order of 150-250 mw, although there are still many problems to be solved, mainly pertaining to materials. In this connection, reports are presented on further increase in electro-conductivity, expansion of temperature boundaries, reduction of dimensions and increase in effectiveness on the basis of nonequilibrium ionization, pulsating flow of plasma and transition to electrodeless systems.

Author (TAB)

N68-14541# California Univ., Livermore. Lawrence Radiation Lab.

FLUX-COMPRESSION GENERATORS

E. I. Bichenkov Sep. 1967 12 p refs
Transl. into ENGLISH Akad. Nauk SSSR (Moscow), v. 174, no. 4, 1967 p 779-782

(UCRL-TRANS-10133) CFSTI: HC\$3.00/MF\$0.65

The results of work done at Hydrodynamics Institute of the Siberian Division of the USSR Academy of Sciences on the construction of explosion devices converting the energy of the explosives into the energy of a magnetic field are summarized. Several methods are described.

NSA

N68-14585*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PARAMETRIC ANALYSIS OF RADIOISOTOPE CASCADED THERMOELECTRIC GENERATORS

James T. Ward and Robert Ruch Washington Jan. 1968 27 p refs
(NASA-TM-X-1501) CFSTI: HC \$3.00/MF \$0.65 CSCL 18B

The generator consisted of a high-temperature silicon-germanium first stage and a lower-temperature lead telluride second stage was placed concentrically around a cylindrical fuel block. Heat was rejected from the outer surface of the generator shell; in most cases, fins were required to augment the heat rejection. The Si-Ge hot-junction temperature range was 1089° to 1255°K. The PbTe hot-junction temperature was fixed at 811°K and the PbTe cold-junction temperature varied from 422° to 700°K. The fuel-block length-diameter ratio varied from 0.5 to 10.0. The fuel-block-volume power-density range was 0.5 to 10.0 watts per cm³. The generator power output was fixed at 250 watts electric. The performance of cascaded generators is also compared with the performance of single-stage Si-Ge generators. The results indicate that the cascaded generator operating at a Si-Ge hot-junction temperature of 1089°K had a minimum specific weight of 220 lbs per kilowatt electric (kW_e) at an efficiency of nearly 7%. For a Si-Ge hot-junction temperature of 1255°K, the minimum specific weight was 170 lbs per kW_e with an efficiency of over 8%. The single-stage Si-Ge generator with a hot-junction temperature of 1255°K had a minimum specific weight of 100 lbs per kW_e at an efficiency slightly below 6%. Author

N68-14630* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARAMETRIC ANALYSIS OF RADIOISOTOPE-THERMOELECTRIC GENERATORS

James J. Ward, William J. Bifano, and Larry S. Blair Washington Oct. 1967 22 p ref
(NASA-TM-X-1453) CFSTI: \$3.00 CSCL 10B

A parametric analysis of a radioisotope-thermoelectric power generator is presented. A cylindrical heat-source geometry was assumed with either lead telluride or silicon-germanium thermoelectric elements located around the lateral surface of the fuel block. The heat source was treated parametrically by using the effective-volume power density of the heat source as a variable. Generator efficiency and specific weight were determined for fuel-block length-to-diameter ratios from 0.5 to 10.0, effective-volume power densities from 0.5 to 10.0 watts per cubic centimeter (W/cc), thermoelectric element hot-junction temperatures of 811°K for lead telluride and 1089° and 1255°K for silicon-germanium, and generator electrical output powers from 100 to 1000 watts. The results indicate that a substantial specific weight advantage is gained by employing silicon-germanium thermoelectric elements rather than lead telluride. In all cases, however, minimum specific weight is achieved at the lowest output power level, that is, 100 watts electric (W_e). For silicon-germanium generators having an output power of 100 W_e, the minimum specific weights are 120 and 88 lb/kW_e (54.5 and 40 kg/kW_e) for hot-junction temperatures of 1089° and 1255°K, respectively, with corresponding generator efficiencies of 4.1 and 5.8 percent. Author

N68-14746# Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart (West Germany).

OPTIMIZATION OF THE MHD-GENERATOR USING A LIQUID METAL AS A WORKING MEDIUM [DIE OPTIMIERUNG DES MIT EINEM FLÜESSIGEN METALL BETRIEBENEN MHD-GENERATORS]

N. Kayukawa Nov. 1967 27 p refs In GERMAN; ENGLISH summary
(DLR-FB-67-71; DVL-683)

The optimization of a direct current and of an electrodeless induction type of MHD-power-generator, which are operated by using an incompressible fluid as a working medium is examined by employing the method of variational calculus for the total electrical power. The solutions of Euler's equations are the spatial constancy

of the pressure for a d.c. MHD-generator and the spatial constancy of the flow velocity of an a.c. MHD-generator respectively. This performance of the fluid flow, that is the construction of the channel geometry, gives a physically attainable maximum efficiency. Author

N68-16230# Minnesota Mining and Mfg. Co., St. Paul, Minn.
560-WATT PORTABLE THERMOELECTRIC POWER MODULE Final Report

Thomas L. Nystrom, John H. Stauffer, and Edwin W. Pitcher Sep. 1967 57 p refs
(Contract DA-44-009-AMC-1607(T))
(AD-662770)

The objective of the research and development program is the design, fabrication, testing and delivery of a thermoelectric power module with the following principal requirements: Power - 560 watts at 28 volts dc; Weight - 35 pounds or less; Fuel - JP-4, CITE, or diesel fuels logistically available to the U.S. Army; Life - Continuous or intermittent operation of at least 1000 hours; Noise Level - Inaudible at a distance of 100 feet. A power module was delivered which demonstrates compliance with these requirements. Author (TAB)

N68-15499# Federal Power Commission, Washington, D. C. Bureau of Power.

DEVELOPMENT OF ELECTRICALLY POWERED VEHICLES
Feb. 1967 53 p refs Prepared for Comm. on Commerce, U. S. Senate
(PB-174982) CFSTI: HC \$3.00/MF \$0.65

Contents: History of electric vehicles; Present status of battery-powered vehicles; Electric energy storage systems; Electric vehicles; Public acceptance of the short-range electric vehicle; Electric power requirements; The electric vehicle and air pollution; Electric vehicle legislation. Author

N68-15525# Army Electronics Labs., Fort Monmouth, N. J. Electronic Components Lab.

FUEL CELL-BATTERY POWER SOURCES FOR ELECTRIC CARS

Galen R. Frysinger 1967 8 p Presented at Power Systems for Elec. Vehicles Symp., Columbia Univ., 6-8 Apr. 1967
(AD-662235)

Through the use of a fuel cell-battery hybrid power source all of the so-called vehicle battery problems can be overcome. This power source allows an electric vehicle to have: (1) Full range capability. (2) Excellent acceleration characteristics. (3) Very fast energy refuel. To achieve the performance outlined for the vehicle, requires the successful development of a 150 watt hour per pound molten electrolyte battery and a 20-35 lbs/KW hydrocarbon fuel cell. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years. Author (TAB)

N68-15541# Army Electronics Labs., Fort Monmouth, N. J. Electronic Components Lab.

FUEL CELL-ENERGY STORAGE HYBRID SYSTEMS FOR VEHICLES

Galen R. Frysinger 1967 27 p
(AD-662236)

Through the use of a fuel cell-battery hybrid power source all of the so called vehicle battery problems can be overcome. This power source allows an electric vehicle to have: (1) Full range capability. (2) Excellent acceleration characteristics. (3) Very fast energy refuel. To achieve the performance outlined for the military vehicle requires the successful development of a 150 watt hour per pound molten electrolyte battery and a 20-35 lbs/KW hydrocarbon fuel cell. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years. Author (TAB)

05 ENERGY CONVERSION

N68-16712# Army Electronics Labs., Fort Monmouth, N. J. Electronic Components Lab.

BATTERY-FUEL CELL SYSTEM

Galen R. Frysinger 1967 22 p Presented at 21st Ann. Power Sources Conf., Atlantic City, May 1967 (AD-662234)

Through the use of a fuel cell-battery hybrid power source for vehicular propulsion all of the battery problems can be overcome. This power source allows an electric vehicle to have: (1) full range capability, (2) excellent acceleration characteristics, and (3) use of conventional hydrocarbon fuels. To achieve the required performance depends upon the successful development of a 150 watt hour per pound molten electrolyte battery and a 20-35 pound per kilowatt hydrocarbon-air fuel cell. Research progress indicates that these goals should be achieved in operational hardware within the next five to ten years.

Author (TAB)

N68-16286*# National Aeronautics and Space Administration, Washington, D. C.

MOTION OF CONDUCTING BODIES IN A MAGNETIC FIELD

Ya. Ya. Lielypeter, ed. Feb. 1968 152 p refs Transl. into ENGLISH of the book "Dvizheniye Provodyashchikh Tel v Magnitnom Pole" Riga, Izd. Zinatne, 1966

(NASA-TT-F-460) CFSTI: HC\$3.00/MF\$0.65 CSCL 201

CONTENTS:

1. STATE OF THE THEORY OF MAGNETOHYDRODYNAMIC INDUCTION MACHINES WITH WORKING MEDIA OF LIQUID METAL Ya. Ya. Lielypeter p 1-12 refs

2. ELECTROMAGNETIC PROCESSES IN AN IDEAL, INDUCTION MHD MACHINE A. K. Veze and L. Ya. Ulmanis p 13-37 refs

3. HIGHER SPATIAL HARMONICS OF THE MAGNETIC FIELD OF AN INDUCTION MHD MACHINE Yu. Ya. Mikel'son p 38-57 refs

4. TRANSVERSE EDGE EFFECT IN PLANE INDUCTION MAGNETOHYDRODYNAMIC MACHINES A. Ya. Vilnitis p 58-85 refs

5. LONGITUDINAL EDGE EFFECT IN LINEAR INDUCTION MHD MACHINES Ya. Ya. Valdmanis p 85-98 refs

6. PONDEROMOTIVE FORCES ACTING UPON CONDUCTIVE BODIES IN THE TRAVELING MAGNETIC FIELD OF A CYLINDRICAL INDUCTOR Yu. K. Krumin' p 99-121 refs

7. THEORY FOR THE PROPAGATION OF PULSED ELECTROMAGNETIC FIELDS IN MOVING CONDUCTIVE MEDIA G. Ya. Sermons p 121-147 refs

N68-16287*# National Aeronautics and Space Administration, Washington, D. C.

STATE OF THE THEORY OF MAGNETOHYDRODYNAMIC INDUCTION MACHINES WITH WORKING MEDIA OF LIQUID METAL

Ya. Ya. Lielypeter *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 1-12 refs

Survey information is presented on the theory of magnetohydrodynamic (MHD) induction machines, with particular reference to analyzing the properties of a set of structural diagrams at preset specific loads and geometrical dimensions. The state of MHD induction machine electromagnetic theory is examined in some detail; this theory comprises the study of electromagnetic field structure in the working gap of the machine, as well as of processes in the magnetic and electrical circuits which determine the effective resistance and reactance of the windings. Also reviewed are studies pertaining to the plane linear MHD machine; the

transverse edge effect in a plane MHD induction machine; magnetic field structure of an inductor of finite length; the theory of cylindrical MHD induction machines; and the motion of conducting bodies in pulsed electromagnetic fields. A reference bibliography is included. M.G.J.

N68-16288*# National Aeronautics and Space Administration, Washington, D. C.

ELECTROMAGNETIC PROCESSES IN AN IDEAL, INDUCTION MHD MACHINE

A. K. Veze and L. Ya. Ulmanis *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 13-37 refs

A summary is presented on the solutions for electromagnetic processes in a conductive band located in a traveling magnetic field of a flat inductor. It is assumed that the dimensions of the device are infinite in the direction of motion of the field and in the direction in which the electric current passes. Author

N68-16289*# National Aeronautics and Space Administration, Washington, D. C.

HIGHER SPATIAL HARMONICS OF THE MAGNETIC FIELD OF AN INDUCTION MHD MACHINE

Yu. Ya. Mikel'son *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 38-57 refs

Certain similarities between problems involved in the theory of asynchronous engines and induction magnetohydrodynamic (MHD) machines are noted, and the factors causing the deviation of the traveling magnetic field from a sinusoidal one are identified. Studies on higher spatial harmonics (HSH) are surveyed, and the results are given of investigations pertaining to the harmonics produced due to the spatial distribution of the multiphase stator winding, and their influence upon the motion of the rotor. Emphasis is placed on theoretical computations of HSH from the spatial distribution of the winding with a smooth steel surface of the stator; and the influence of an inductor surface having projections on the electromagnetic field distribution in a conductive band. Analytical computations are presented which may be used to obtain the coefficients for determining the distribution of the electromagnetic field, the force density, and Joule heat losses in the channel of an induction MHD machine. A reference bibliography is included. M.G.J.

N68-16290*# National Aeronautics and Space Administration, Washington, D. C.

TRANSVERSE EDGE EFFECT IN PLANE INDUCTION MAGNETOHYDRODYNAMIC MACHINES

A. Ya. Vilnitis *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 58-85 refs

The problem is formulated for the general case of a plane induction magnetohydrodynamic machine consisting of two plane stators (inductors) with m-phase winding, a plane channel with molten metal, and a thermal insulation channel. The factors influencing the transverse edge effect are described, and the theories and mathematical methods used in the computations are assessed. Solutions are given for infinitely wide model systems. An analysis is presented of the transverse edge effect in pure form, i.e., when there is no attenuation of the field in the clearance, which is achieved in the limit by the thin clearance between the inductors. Other theories pertaining to plane-parallel field in the clearance of the machine are reviewed. Consideration is also given to the transverse edge effect in induction pumps relative to the transition from an extremely thin plate between the inductors to a plate of finite thickness. A reference bibliography is included. M.G.J.

N68-16291*# National Aeronautics and Space Administration, Washington, D. C.

LONGITUDINAL EDGE EFFECT IN LINEAR INDUCTION MHD MACHINES

Ya. Ya. Valdmanis *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 85-98 refs

A state-of-the-art survey is presented on research in connection with the longitudinal edge effect in magnetohydrodynamic (MHD) machines. Allowance is made for their specific properties, such as an unlimited secondary circuit, and a practically infinite magnetic permeability of the magnetic circuit. It is assumed that the channel of molten metal is infinite, and the longitudinal effect is related to the finiteness of the inductor which is represented by a smooth magnetic circuit (in theoretical computations) with linear current loading given on its surface in the form of a traveling wave. Only the electrodynamic portion of the computation is investigated in each report considered, i.e., the molten metal of the secondary circuit is replaced by a solid metal moving at a constant velocity. The results are obtained from a solution of the Maxwell equations, in differential or integral forms, with the corresponding boundary conditions. Attention is focused on studies pertaining to the magnetic field of a finite inductor (longitudinal edge effect in a primary circuit), and to the magnetic field of a finite inductor with a secondary circuit. M.G.J.

N68-16292* National Aeronautics and Space Administration, Washington, D. C.

PONDEROMOTIVE FORCES ACTING UPON CONDUCTIVE BODIES IN THE TRAVELING MAGNETIC FIELD OF A CYLINDRICAL INDUCTOR

Yu. K. Krumin' *In its Motion of Conducting Bodies in a Magnetic Field* Feb. 1968 p 99-121 refs

Problems encountered in designing a device using ponderomotive forces, which influence the conductive media located in the traveling magnetic field, are surveyed. Particular reference is made to the progress achieved in developing methods for calculating these forces, particularly their maximum values, as a function of other characteristics of the device. The problem areas considered pertain to the cylindrical inductor and its electromagnetic field; solutions to the problem of a conductive medium with a certain configuration placed in the inductor, and the corresponding solutions for the ponderomotive forces; methods of representing the results; the solid conductive cylinder in the field of an ideal inductor; the hollow conductive cylinder in the field of an ideal inductor; the solid cylinder having finite length in the field of an ideal inductor; the conductive cylinder in the field of a real inductor; and the conductive sphere in the field of a cylindrical inductor. M.G.J.

N68-17223* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

SPACE VEHICLE MISSILE POWER SUPPLIES Annotated Bibliography

Mildred Benton (George Washington Univ.) Redstone Arsenal Ala. Redstone Sci. Inform. Center Nov. 1967 226 p refs Prepared jointly with NASA and Army (Contract DAAH01-67-C-1036(Z)) (NASA-TM-X-60877; RSIC-743) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

This annotated bibliography contains 700 citations from open literature on power supplies. It is oriented toward batteries, fuel cells, thermionics, thermoelectrics, nuclear energy sources, and other new concepts of direct energy conversion which may be adaptable to space vehicles. Author

N68-17793 Advisory Group for Aerospace Research and Development, Paris (France).

COMBUSTION AND PROPULSION

H. M. de Groff, ed., J. Fabri, ed., R. F. Hoglund, ed., T. F. Nagev,

and M. E. Rumbaugh, Jr. London (New York), Gordon and Breach Sci. Publishers 1967 900 p refs In ENGLISH and FRENCH Presented at 6th Colloq. on Energy Sources and Energy Conversion, Cannes, France, 16-20 Mar. 1964 (AGARDograph-81)

In the panel papers presented, emphasis is focused on dynamic energy conversion, and the thermal, chemical, and radiant sources of direct energy conversion.

N68-17794 Atomic Energy Commission, Washington, D. C. Reactor Development Div.

NUCLEAR ENERGY SOURCE LIMITATIONS FOR DYNAMIC ENERGY CONVERSION SYSTEMS

Frank K. Pittman and Joseph D. Lafleur, Jr. In AGARD Combust. and Propulsion 1967 p 5-23 refs

The limitations which the nuclear energy source imposes on the dynamic power system fall into two categories. First, because of the premium which the space environment places on high temperature operation, materials throughout the system are called on to operate at high temperatures. Since the heat source must operate at the highest temperature of the cycle, the reactor fuel temperature is a potential limitation on cycle performance. Second, the nuclear radiation which accompanies the release of nuclear energy will require shielding or "hardening" to reduce the harmful effects on spacecraft components, and shielding to prevent injury to crews. The nuclear power plants will be the best, and in many cases, the only, means of meeting future space power needs. Therefore, these limitations and the associated development problems have been identified and are being solved. Author

N68-17796 Thompson Ramo Wooldridge, Inc., Cleveland, Ohio. Electromechanical Div.

RADIATOR DESIGN LIMITATIONS FOR DYNAMIC CONVERTERS

Alfred Koestel and Carmeron M. Smith In AGARD Combust. and Propulsion 1967 p 49-109 refs

This paper reviews the technology for design of radiators associated with dynamic converters in which the working fluid is condensed directly in the tubes of the radiator. In the first part of the paper the general design procedure and its optimization are discussed. Various constraints, namely, (1) condensing fluid mechanics; (2) radiation heat transfer from fins and tubes; and, (3) meteorite protection; are integrated through use of information flow charts indicating the sequence of computations. The appropriate equations and their source are noted. A method for estimating the optimum condensing temperature is explained and developed. The application of Lagrangian multipliers in the optimization of design is discussed. The second part of the paper describes the fluid mechanics of the condensing process. Single-phase boundary layer stability techniques are applied to two-phase flow mechanics for purposes of predicting the transition of flow regimes. Experimental data which correlate wetting and nonwetting characteristics in the forced convection condensation of mercury are presented. Critical mercury drop size measurements at incipient entrainment are described and the conditions for "fog flow" of entrained liquid are defined. In conclusion, a review of problem areas of interest to designers of condensers for space power systems is presented. This review includes gravity effects such as: (1) runback (slugging) instability in vertical tubes; (2) horizontal tube gravity effects, and (3) the Rayleigh-Taylor instability. Author

N68-17797 Oak Ridge National Lab., Tenn. Reactor Div.

HEAT TRANSFER LIMITATIONS FOR DYNAMIC CONVERTERS

A. P. Fraas In AGARD Combust. and Propulsion 1967 p 111-134 refs

Heat transfer considerations are major limiting factors in

05 ENERGY CONVERSION

the design, development, and operation of dynamic conversion systems for space power plants. The nature of these limitations varies with the component. For example, in the heat source—whether nuclear or solar—thermal conduction affects the thermal stresses, thermal distortion, and local hot spots. These factors are likely to limit the practicable power density in the heat source to a lower value than might be permitted by the obvious problem of heat transfer from the heated solid surface to the fluid cooling it. The latter is likely not to be a difficult problem except for local hot spots caused by poor flow distribution or the like. Other heat transfer limitations include problems in the boilers and condensers for Rankine cycle systems and heat conduction, emission, and reflection in the radiator. This paper presents some typical examples of these problems that are particularly likely to be determining factors in the design of turbine-generator space power plants. Author

N68-17799 Societe Hispano-Suiza, Bois-Colombes (France).
THERMODYNAMIC ASPECTS IN TWO PHASES FOR SPACE APPLICATIONS [THERMODYNAMIQUE DU CYCLE A DEUX PHASES POUR APPLICATIONS SPATIALES]
J. Plotkowiak *In* AGARD Combust. and Propulsion 1967 p 153-179 refs *In* FRENCH; ENGLISH summary

Study of the possible use of the Rankine cycle in gas turbines for space applications and definition of the lower power limit which would still provide good performances. Research of working fluids suitable for these engines. Analysis of losses and effect of irreversible processes within the various components of the power plant on the system efficiency. Technological limitation and possible development of a low-power turbocompressor unit using the Rankine cycle. Author

N68-17802 AiResearch Mfg. Co., Los Angeles, Calif.
WORKING GAS SELECTION FOR THE CLOSED BRAYTON CYCLE
John L. Mason *In* AGARD Combust. and Propulsion 1967 p 223-252 refs

Systems based on the Rankine cycle have received primary attention in the last decade for nuclear-turboelectric space power production in the kilowatt range. However, recent developments in high-temperature energy sources, continued progress in component efficiency and reliability coupled with liquid metal handling problems in Rankine cycle systems have caused a refocusing of attention on the Brayton cycle. The properties of the cycle working gas influence the design of all major components except the alternator. Gas selection indices are developed here for a representative Brayton cycle turbocomponent, the compressor, and a representative heat transfer component, the recuperator. Especially at low power levels, these selection indices indicate substantial advantages associated with use of helium-xenon gas mixtures. Such binary inert-gas working fluids provide outstandingly low Prandtl numbers along with variable molecular weights to meet turbomachinery design requirements at various power levels. Author

N68-17803 TRW Space Technology Labs., San Bernardino, Calif.
NUCLEAR SOURCE LIMITATIONS FOR DIRECT CONVERSION DEVICES
R. W. Bussard *In* AGARD Combust. and Propulsion 1967 p 257-277 refs

Nuclear energy sources from solid-fuel fission reactors to eventual fusion reactors are considered for application to direct conversion. Brief review of system operating requirements provides a background for assessment of the potentialities and inherent physical limitations of these sources for direct conversion. Emphasis is placed on the characteristics of solid-fuel and gaseous-fuel fission reactors for application to thermionic and MHD conversion systems. Author

N68-17805 Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
THERMODYNAMICS OF THERMIONIC ENERGY CONVERSION
W. B. Nottingham *In* AGARD Combust. and Propulsion 1967 p 317-335 refs

The contribution made to the understanding of thermionic energy conversion through thermodynamics is an example of one of the principal applications of this scientific discipline. First, it shows the broad outline of possibility and its bounds. It yields numerical results where details are not available. The next step toward the achievement of the practical application of the principle of energy conversion through thermionics demands a detailed understanding of many phenomena related to electron physics. A few of these may be enumerated as (1) properties of the thermionic emitter, (2) properties of the electron collector, and (3) ionization and excitation of gas (cesium) in the interelectrode space. Cesium vapor is most helpful as a substance in converter technology, since it adsorbs on refractory metal emitters such as tungsten or rhenium to lower the work-function and thus permits the emission of a high electron current density. Cesium is easily ionized by two methods: (1) contact with the heated emitter surface or (2) collision with high-energy electrons. The ions reduce or eliminate the space charge limitation of the available current. The collector work-function is determined by its temperature, its base material and, most of all, by the adsorbed layer of cesium. Great names of electron physics are associated with the development of the fundamentals required for the understanding of thermionic energy conversion. These scientists include Richardson, von Laue, Langmuir, Schottky, Franck, Hertz, Fowler, and others. Voltage-current curves demonstrate quantitatively the two principal modes of converter operation which are the "passive" and the "ignited", and provide the experimental data. The analysis of these data depends on the insight furnished through the application of thermodynamics and statistics to this area of research. Author

N68-17808 Commissariat a l'Energie Atomique, Saclay (France).
ON THE BEHAVIOR OF ENERGY CONVERSION LEFT FROM VAPOR IONIZED BY FISSION PRODUCTS [SUR UN PROCEDE DE CONVERSION D'ENERGIE A PARTIR DE VAPEUR IONISEE PAR PRODUITS DE FISSION]
Siegfried Klein and Pierre Kraus *In* AGARD Combust. and Propulsion 1967 p 357-374 refs *In* FRENCH; ENGLISH summary

When two electrodes maintained at different temperatures are immersed in ionized vapor, a potential difference appears between them. Tests have been performed in a nuclear reactor channel where the predominating ionizing agent is constituted by the fission products released by a thin layer of uranium oxide. Experience has shown that in this conversion process the negative charge carriers are not constituted by electrons only but also by negative ions or negative droplets. Further experimentation should permit the development of these converters. Author

N68-17809 Northwestern Univ., Evanston, Ill. Gas Dynamics Lab.
THE DIAGNOSTICS OF PLASMAS
John A. Thornton, Richard C. Warder, Jr., and Ali Bulent Cambel *In* AGARD Combust. and Propulsion 1967 p 377-418 refs

In energy conversion processes, both natural and man-made plasmas may be used to advantage. However, regardless of origin, it is necessary to know the properties of plasmas before reliable energy conversion devices can be designed and constructed. It is the purpose of this paper to highlight the theoretical considerations underlying plasma diagnostic techniques used in the gas dynamics laboratory in conjunction with a variety of plasma generation facilities. Author

N68-17810 Purdue Univ., Lafayette, Ind.

THERMODYNAMICS OF MHD ENERGY CONVERSION

Harold M. DeGroff and Richard F. Hoglund *In* AGARD Combust. and Propulsion 1967 p 419-475 refs

Previous theoretical and experimental work is reviewed with an over-all view of accessing the accuracy to which the performance of MHD Energy Conversion devices can be predicted. Both open- and closed-cycle linear magnetohydrodynamic generators are discussed. The recent progress made in open-cycle generators, with combustion reactions serving as the heat source, is described. Equilibrium thermodynamics is used to determine the theoretical performance of these generators. Particular attention is given to the loss mechanisms at the edges of the field regions and through the wall and electrode boundary layers. Existing experimental results are compared with the theoretical predictions. Major engineering problems are pointed out and discussed. In the case of closed-cycle generators, successful operation depends upon achievement of adequate electrical conductivity at relatively low temperatures. The most promising approach is through non-equilibrium ionization. The thermodynamic energy exchange processes which govern the extent of non-equilibrium ionization are discussed. Future prospects for development and key research areas pertinent to closed-cycle MHD power generation are described. Author

N68-17811 Newcastle Univ. (England). Dept. of Chemical Engineering.

NON-EQUILIBRIUM MODES OF MHD CONVERTERS

Ian Fells *In* AGARD Combust. and Propulsion 1967 p 477-500 refs

The classical linear flow, crossed field MHD generator can be made to operate with about ten per cent conversion efficiency but has inherent defects. Probably the most serious problems stem from the high temperatures necessary to maintain the conductivity of the driver gas stream by thermal (i.e. usually equilibrium) ionization of seed material introduced into the gas stream. In open cycle systems failure of electrode and duct materials occur, and heat transfer to the magnet system causes loss of efficiency. Breakdown of the electrical insulation properties of the refractories also takes place. In closed cycle systems using a nuclear pile as heat source, the temperatures required for thermal ionization are unlikely to be realized in present or future designs of piles. A variety of approaches to the problem can be adopted. The reaction zones of hydrocarbon flames exhibit marked departure from equilibrium and, associated with this, ionization levels one million times greater than the predicted equilibrium values. This process is incompletely understood but phased combustion aimed at promoting this effect can lead to systems in which seed material is unnecessary. Oscillating combustion systems operating at both low and high frequencies lead to periodic high ionization levels with a low time averaged temperature. Combustion driven detonations can be maintained in various modes; the spinning mode seems particularly useful for MHD power generation. In addition to lowering the time averaged temperature, the operation of pulsed systems makes possible the generation of alternating rather than direct current. This type of system can be further elaborated by the design of linked cycle systems in which the conductivity generating process is linked to, but not the same as, the driving cycle. The freezing of equilibrium during expansion can lead to high conductivity at lower temperatures; such an effect is applicable to closed as well as open cycle systems. Author

N68-17812 International Research and Development Co. Ltd. Newcastle (England).

A NON-EQUILIBRIUM ELECTRON MODE FOR KILOWATT RANGE MPD SPACE POWER

I. R. McNab *In* AGARD Combust. and Propulsion 1967 p 501-515 refs

Many 'techniques' for producing extra-thermal ionization in magnetoplasma-dynamic (MPD) generators are currently under investigation in the hope that reductions in the operating temperature of these generators will result. This is particularly important in the nuclear closed-cycle concept, which is of interest for space power systems, where the available gas temperature is limited by foreseeable nuclear reactor developments. One method of producing electron concentrations considerably greater than for thermal equilibrium is to rapidly expand the working fluid by means of a nozzle. This effect is investigated here, particular attention being paid to its influence on MPD generators in the range 10-100 kw output. Author

N68-17813 Naples Univ. (Italy).

GENERALIZED SAHA EQUATION FOR NON-EQUILIBRIUM TWO TEMPERATURE PLASMAS

R. Monti and L. G. Napolitano *In* AGARD Combust. and Propulsion 1967 p 517-537 refs
(Contract AF 61(952)-548)

The present work is intended as a higher approximation with respect to the theory which proposes the use of the Saha equilibrium equation based on the electron temperature; in the present analysis both electrons and atoms temperature are taken into account for the calculation of the equilibrium electron concentration. A thermodynamical analysis of a ternary plasma (composed by one species of atoms, one species of ions and electrons) is presented and the components of the mixture are considered ideal gases. The state equations of the mixture, considered as thermodynamic system with four degrees of freedom, are written therefrom obtaining the explicit expressions of the affinities (A_i) for the rate processes (i.e., ionization, A_1 and thermalization A_2). The usual form of the Saha equations is recovered when one sets $A_1 = A_2 = 0$ (conditions of "full" equilibrium). The generalized form of the Saha's equation is obtained when one lets only $A_1 \neq 0$, thus obtaining, upon the acceptable hypothesis of thermodynamic stability, an explicit expression relating the degree of ionization (α) to the three remaining state parameters of the mixture. As an application of this theory the electrical conductivity has been calculated under a number of suitable simplifying hypotheses, as a function of the plasma pressure and temperatures. The correlation of the available experimental results appears to be improved with respect to other more simplified theories. Author

N68-17814 Air Force Systems Command, Wright-Patterson AFB, Ohio.

POTENTIALITIES OF DIRECT ELECTRO FLUID DYNAMIC ENERGY CONVERSION PROCESSES FOR POWER GENERATION, PART A

Hans von Ohain and Frank Wattendorf *In* AGARD Combust. and Propulsion 1967 p 541-561 refs

Two promising fields for the direct conversion of fluid dynamic energy into electrical energy are magneto-fluid dynamics (MFD) and electro-fluid dynamics (EFD). The major research effort to date has been in MFD processes, whereby the fluid dynamic energy of an electrically conductive medium in a thermodynamic cycle is transformed into electrical energy by passing through a magnetic field. The present paper is devoted to EFD conversion, whereby the fluid dynamic energy of a working medium containing ions or charged colloids is transformed into electrical energy by passing through an electrostatic field. Therefore, we see that EFD is not in the strict sense a member of the MFD family, but that both are members of a broader family. However, we do not consider EFD as a competitor to MFD, but rather as prospective complement in the energy conversion spectrum. EFD processes are characterized by low current density and high voltage. While the power density is lower than that indicated for MFD, the power-to-weight ratio may still prove favorable, due to the lack of need for heavy magnetic equipment. Author

05 ENERGY CONVERSION

N68-17815 Air Force Systems Command, Wright-Patterson AFB, Ohio.

PERFORMANCE CHARACTERISTICS OF ELECTRO-FLUID DYNAMIC ENERGY CONVERSION PROCESSES EMPLOYING VISCOUS COUPLING, PART B

Maurice O. Lawson *In* AGARD Combust. and Propulsion 1967 p 563-580 refs

In this study, the performance characteristics of electro-fluid dynamic energy conversion processes employing viscous coupling between the neutral molecules and the electrically charged particles are determined; specifically, the conversion efficiency and other electro-fluid dynamic performance values, including the effects of the physical properties of the working medium, the influence of geometric parameters, and scaling. Author

N68-17816 Air Force Systems Command, Wright-Patterson AFB, Ohio.

PERFORMANCE CHARACTERISTICS OF ELECTRO-BALLISTIC GENERATORS, PART C

Seigfried Hasinger *In* AGARD Combust. and Propulsion 1967 p 581-601 refs

For the stubby type particle beam, the typical electric field pattern is essentially that which exists between two infinite plane parallel electrodes. Space charge effects limit the electric power density in this case. For the slender type beam, the presence of radial field components greatly reduces these space charge effects. However, the beam spread caused by the radial field components again limits the power density. Calculations have shown that the effects of these limitations on the generator performance are quite similar in each case. The slender beam allows a several times larger power density referred to the initial beam diameter, however, with the beam spread taken into account, the power density is correspondingly lower. Thus performance derived for the infinite plane parallel case can be considered generally characteristic for the ballistic generator. Author

N68-17817 Air Force Systems Command, Wright-Patterson AFB, Ohio.

ION GENERATION BY CORONA DISCHARGE FOR ELECTRO-FLUID ENERGY CONVERSION PROCESSES, PART D

Maurice O. Lawson *In* AGARD Combust. and Propulsion 1967 p 603-612 refs

Corona discharge configurations are presented and research results are discussed. These configurations enable simultaneous employment of more than one working medium (e.g. gas and vapor for the formation of charged colloids). Also, these electrode configurations do not require an electrical power input for the ion generation, rather, the ionization energy is extracted from the available fluid dynamic energy of the working medium. Theoretical approaches and numerical calculations determining the unipolar ion current as functions of pressure, speed, ion or colloid mobility, physical properties of the working medium, and geometric parameters including geometric scaling are presented and compared with the results of an experimental investigation. Author

N68-17818 Air Force Systems Command, Wright-Patterson AFB, Ohio.

EXPERIMENTAL TECHNIQUES IN ELECTRO FLUID DYNAMIC ENERGY CONVERSION RESEARCH, PART E

Michael Hawes *In* AGARD Combust. and Propulsion 1967 p 613-630

The purpose of this study is to discuss experimental equipment and testing methods for electro-fluid dynamic power generation. The major topics of experimental research which are under study are as follows: (1) Closed-cycle or simulated closed-cycle operation. (Included are investigations on fluid-dynamic energy transfer from a supersonic jet of high molecular weight to a recirculating gas of

low molecular weight; the mass flow of the supersonic jet being small in comparison to that of the recirculating gas.) (2) Methods of generation of ions or charged colloids of one polarity employing corona discharge. (3) Effects of the geometric configuration of the conversion section and determination of scaling characteristics. (4) Effects of variation in pressure in the conversion section. (5) Equipment and instrumentation for high voltage, low current, power measurements. These research topics influenced the design of the major components of the test apparatus and the testing methods which will be described in this paper. Author

N68-17819 Politecnico di Torino (Italy).

THERMODYNAMICS OF THERMOELECTRIC CONVERSION

V. Ferro *In* AGARD Combust. and Propulsion 1967 p 633-649 refs

After an examination of the experimental thermoelectric phenomena, their interpretation and correlation is made, according to the thermodynamic theory of irreversible processes. The case is then considered of an ideal thermoelectric generator, operating at optimum efficiency or at maximum electric power output conditions. Author

N68-17820 Advisory Group for Aerospace Research and Development, Paris (France).

HIGH-TEMPERATURE THERMOELECTRIC MATERIAL LIMITATIONS

C. M. Kelley and G. C. Szego *In* AGARD Combust. and Propulsion 1967 p 651-677 refs

The characteristics of materials set many limits on their use in thermoelectric generators, the limiting factors varying in importance from one material to another. The Seebeck generator demands an extrinsic or mixed valence semiconductor. All semiconductors are limited by vapor or decomposition pressure at sufficiently high temperatures. This may be roughly estimated from the heat and entropy of vaporization, related in turn to structure and bond strength. The relation of bond strength to band gap is very approximate as presently known. Certain mixed valence semiconductors have shown adequate thermoelectric properties in the liquid state. The modules are most frequently limited by the mechanical stability of the contacts. Spring loading for high-temperature application requires some device complications. Radiative heat transfer need not be a serious problem below 1800°K. Above this temperature it may seriously impair efficiency. Because of the limited range of peak performance of individual materials, efficient devices will require graded materials or some degree of staging. At high temperatures the materials stability problem will force this to be staging. Over-all it appears that thermoelectric devices may be ultimately developed to operate at temperatures as high as 2000°K. Author

N68-17821 Admiralty Materials Lab., Poole (England).

FUEL CELL REACTANT PROPERTIES

R. G. H. Watson *In* AGARD Combust. and Propulsion 1967 p 681-707 refs

The fuel cell is considered as a chemical energy converter and the components which contribute to its important dimensions are discussed. The performance of the fuel cell system is related to the properties of its reacting components and the contribution they make to the various sources of energy loss. The values of some of these properties are readily accessible, such as the density and energy content of a fuel, which help to determine the maximum specific energy content of a fuel cell system. Other properties, which related to energy losses, and determine cell efficiency from which the actual specific energy content is determined, may be a function of a particular cell design. For instance the amount of polarization due to slow fuel electrode reaction will involve a wide range of properties including those of

electrode and fuel materials, at the cell conditions used. The reactant properties that are useful in fuel cell system design are derived in this discussion and concern the fuel, oxidant and exhaust products, and the electrodes and electrolyte. Appropriate values are tabulated and used to illustrate factors in cell design. Areas of apparent ignorance are discussed in relation to the need for further work. Author

N68-17823 Pennsylvania Univ., Philadelphia. Electrochemistry Lab.

ELECTROCHEMICAL CATALYSIS

J. O'M. Bockris and H. Wroblowa. In AGARD Combust. and Propulsion 1967 p 717-767 refs

The factors affecting the rates of chemical and electrochemical reactions are discussed. The differences between chemical and electrochemical catalysis arising from the existence of the applied field and from the presence of solvent are shown from the theoretical and experimental points of view. A review of the possible ways to enhance electrocatalysis is presented. The mechanisms of several electrode reactions (oxidation of hydrogen, hydrocarbons, oxalic acid, oxygen reduction) pertinent to fuel cell reactions are discussed in detail, as a prerequisite to all catalytic considerations. A crude attempt is made to formulate some theory of the mechanism of catalysis, on the basis of an experimental comparison of the reaction rates on various catalysts of hydrogen and oxygen evolution and of ethylene oxidation. Needed trends in research are indicated. Author

N68-17824 Western Reserve Univ., Cleveland, Ohio.
KINETIC FACTORS IN FUEL CELL SYSTEMS: THE OXYGEN ELECTRODE

Ernest Yeager and Akiya Kozawa. In AGARD Combust. and Propulsion 1967 p 769-793 refs

The oxygen electrode occupies a unique position with respect to fuel cells since it is the cathode of virtually all practical fuel cell systems. Experimental studies of the reduction of oxygen on porous carbon and metal electrodes of the types used as cathodes in aqueous fuel cells support the conclusion that the reduction proceeds through a peroxide intermediate. Significant concentrations of peroxide may accumulate in the solution adjacent to the cathode surface in operation at higher current densities. While the reduction of molecular oxygen to peroxide in alkaline solutions is characterized by relatively low polarization on most cathodes in aqueous low-temperature fuel cells, the subsequent reduction of the peroxide usually is very irreversible. An immediate consequence is that most low-temperature fuel cells, even at low current densities, operate at substantially less than the cell voltage predicted thermodynamically on the basis of the complete four-electron reduction of oxygen. The results of various studies of the oxygen-peroxide couple on carbon, graphite, lithiated nickel oxide, and platinum are summarized with emphasis on the dependence of the results on electrode composition, surface preparation, pH, and electrolyte composition. Some of the implications of these fundamental studies in the optimization of oxygen cathodes for aqueous fuel cells are discussed. Author

N63-17825 General Motors Corp., Dayton, Ohio. Allison Div.
THERMALLY REGENERATIVE FUEL CELLS
R E Henderson. In AGARD Combust. and Propulsion 1967 p 795-809 refs

The thermally regenerative fuel cell is discussed in terms of modes of regeneration. Electrothermal as well as thermal regeneration schemes are described. The thermodynamic cycle is analyzed from the standpoint of reversible thermodynamics. A limiting efficiency is thereby calculated. Certain irreversible steps such as the voltage drop at the fuel cell and heat exchanger inefficiencies are considered from the standpoint of cycle efficiency. A practical

system, namely, the K-Hg system is discussed in light of fuel cell data and boiler separator data. Space power system weights for such a system are estimated on the basis of this data. The various components of such a system are itemized and discussed from the standpoint of anticipated future developments. Author

N68-17826* National Aeronautics and Space Administration, Washington, D. C.

THERMODYNAMICS AND APPLICATIONS OF BIOELECTRO-CHEMICAL ENERGY CONVERSION SYSTEMS

Michael G. Del Duca and John M. Fuscoe. In AGARD Combust. and Propulsion 1967 p 811-839 refs

Bioelectrochemical energy conversion is the process of converting chemical free energy of biologically catalyzed reactions to electrical energy. Particular attention in the past two years has been directed to applying the results of biochemical research and development to this type of energy conversion. This paper considers these applications in a state-of-the-art review and presents a synopsis of suggested applications, ranging from the use of bioelectric currents to identify toxic materials and power human implanted cardiac pacemakers, to the generation of electric power in remote areas of the world. Author

N68-17828 Compagnie Generale de Telegraphie Sans Fil, Puteaux (France). Centre de Recherches Physico-Chimiques.

PHOTO-VOLTAIC CELLS WITH CONCENTRATORS [CELLULES PHOTO VOLTAIQUES AVEC CONCENTRATEURS]

Pierre Leclerc. In AGARD Combust. and Propulsion 1967 p 863-871

Reported is, the effect of development and operational parameters of a photo-diode on its photovoltaic efficiency. Investigation of the effect of the series resistance on generator efficiency and of possible means of improving cell performance. Author

N68-17829 Laboratoire Central des Industries Electriques (France).

EFFECT OF A THERMOPHOTOVOLTAIC CONVERTER [REALISATION D'UN CONVERTISSEUR THERMOPHOTOVOLTAIQUE]

A. Fortini, Ph. Bauduin, and P. Sibillot. In AGARD Combust. and Propulsion 1967 p 873-896 refs

Following a brief survey of the basic theory for the photovoltaic effect, a theoretical analysis is made of the influence of geometrical and electrical parameters defining a photovoltaic cell on the conversion efficiency for the conversion of luminous energy into electrical power. Study of spectral adaptation of the cell. Theoretical predictions and experimental data are compared. Author

N68-17830 Massachusetts Inst. of Tech., Cambridge.
P-I-N STRUCTURES FOR CONTROLLED SPECTRUM PHOTOVOLTAIC CONVERTERS

David C. White and Richard J. Schwartz. In AGARD Combust. and Propulsion 1967 p 897-922 refs

Improved efficiency in the photovoltaic conversion of radiant to electrical energy through the use of radiant energy sources with spectra matched to the electronic energy gap of the junction material was proposed by Pierre Aigrain in 1961. Investigation of systems for the control of the spectrum emitted from the source, the control of the transmitted spectra by selective filters, and the design of cells matched to the resulting spectrum have been undertaken in several laboratories since that date. The major activity has centered around 1500°C sources and germanium p-n junction cells. The factors to be considered in the design of such systems are: (1) Radiant source characteristics, (2) Spectral modification through the use of selective filters and reflectors, (3) Collection

05 ENERGY CONVERSION

efficiency of the p-n junction, (4) The internal dissipation of energy due to series resistance within the cell, (5) The intensity of incident radiation required for efficient operation of the photovoltaic device. Considering the above factors an edge-irradiated P-I-N structure is analyzed and marked advantages are found because of higher output voltages, reduced series resistance, and improved collection efficiencies. This type of structure also possesses potential advantages for the conversion of high energy particles to electrical energy

Author

N68-18025# France. Ministere de l'Air, Paris.
CONTRIBUTION TO THE STUDY OF THE OXYGEN ELECTRODE [CONTRIBUTION A L'ETUDE DE L'ELECTRODE A OXYGENE]

Jean-Claude Sohm Serv. de Doc. Sci. et Tech. de l'Armement
1966 72 p refs In FRENCH /ts Publ. Sci. et Tech. No. 425

Function of oxygen electrodes is examined in detail, and particular attention is given to the mechanism involved in the transport of oxygen in the neighborhood of the line separating the gas-electrolyte-electrode. At ordinary temperatures it is demonstrated that this mechanism is, more or less, the dissolution of the gas in the meniscus that constitutes the solution either in the solution or where it makes contact with the oxygen electrode. It is found that the local pressure rises with the depth and the accumulation of alkali in the meniscus, and it is noted that the current deposited by an oxygen electrode is a function of the length of the line that it realizes. An attempt to define the line current proved fruitless because the line current is almost independent of the geometry of the electrode and the radius of the meniscus, and a qualitative discussion, therefore, is presented following the study of other electrodes of simple geometry. Applications for the development of fuel batteries are considered. Transl. by M.W.R.

N68-19019*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

CRITERIA FOR USE OF RANKINE-MHD SYSTEMS IN SPACE

Lester D. Nichols Washington 1966 24 p refs Presented at the Intern. Symp. on Magnetohydrodyn. Elec. Power Generation, Salzburg, Austria, 4-8 Jul. 1966

(NASA-TM-X-52191) CFSTI: HC\$3.00/MF\$0.65 CSCL 10B

A Rankine cycle that employs an MHD generator is being considered for use in space. These systems must be evaluated on the basis of minimum specific weight, which generally means minimum radiator area to reject the cycle waste heat. Limitations on materials, maximum available magnetic field strength, and the MHD power-generation process itself restrict the range of working fluid temperature and density. The maximum temperature (set by materials limitations) and the minimum radiator area criterion can be used to specify the operating temperature extremes. The operating pressure and density extremes are then determined by the choice of working fluid from the vapor-pressure curve. Since the conductivity increases with electron number density and decreases with increasing fluid density, it may be necessary to seed the working fluid to provide adequate electron concentration at the relatively high densities needed to heat the fluid. These considerations, coupled with the temperature requirements of the cycle, place restrictions on the choice of the seeded working fluid.

Author

N68-19146*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

NUCLEAR THERMIONIC SPACE POWER SYSTEM CONCEPT EMPLOYING HEAT PIPES

Colin A. Heath and Edward Lantz Washington Mar. 1968 24 p refs

(NASA-TN-D-4299) CFSTI: HC\$3.00/MF\$0.65 CSCL 18N

A space power system employing out-of-pile thermionic diodes and using concentric heat pipes for both heating and

cooling of these diodes has been examined. For an early application, the out-of-pile thermionic diode has some advantages over an in-pile system because it is removed from the reactor environment. Moreover, the heat pipe permits emitter temperatures that are not much less than the temperature of the fuel clad. Laboratory data on the performance of heat pipes has been examined and the results used to estimate reasonable performance levels for thermionic diodes which were consequently incorporated into a small, fast-spectrum nuclear reactor concept. Performance levels and system weights including shield weights, have been estimated from first order calculations. The overall system can have the advantage of the safety inherent in heat pipe redundancy and the improved performance available from components that are removed from the reactor environment.

Author

N68-20884# Pratt and Whitney Aircraft, East Hartford, Conn.
FIVE HUNDRED-WATT INDIRECT HYDROCARBON-AIR FUEL CELL SYSTEMS Midterm Report, 10 Apr.-9 Sep. 1967

Calvin D. Greenwood Feb. 1968 47 p

(Contract DAAB07-67-C-0376)

(PWA-3211; ECOM-0376-1; AD-665435)

Work was undertaken to design, fabricate, test, and deliver two man-portable, 500-watt, indirect liquid hydrocarbon-air fuel cell powerplants. Studies showed that use of a boost pump would enable operation from a remote fuel source. Incorporation of a desulfurizer permits use of JP-4 or CITE. Automatic sequencing and control in both the hydrogen generator and the fuel cell assembly are activated from a single manual input signal; automatic shut-down occurs when off-design conditions are sensed. The units are being designed for compactness, minimum weight and sustained operation under Army field conditions. Incorporation of heat exchangers and a fan in the water recovery unit permits recovery of water from the exhaust gases of the hydrogen generator and fuel cell stack. Preliminary studies and breadboard simulation have indicated the feasibility of a design which meets these requirements.

Author (TAB)

N68-21051# Northeastern Univ., Boston, Mass. Photochemistry and Spectroscopy Lab.

RESEARCH IN ENERGY CONVERSION Final Report, 1 Oct. 1963-30 Sep. 1966

Welville B. Nowak, Karl Weiss, and Robert N. Wiener 30 Sep. 1966 686 p refs

(Contract AF 19(628)-3836)

(AFCL-67-0512; AD-665484)

CONTENTS:

1. INVESTIGATIONS IN THERMIONIC AND PHOTOVOLTAIC ENERGY CONVERSION p 1-165 refs

2. PHOTOCHEMICAL STUDIES OF MOLECULAR SYSTEMS p 166-490 refs

3. INVESTIGATION OF NITROGEN-SULFUR SYSTEMS R. N. Wiener, L. I. Rubin, and S. N. Singh p 491-588 refs

N68-21052# Northeastern Univ., Boston, Mass.

INVESTIGATIONS IN THERMIONIC AND PHOTOVOLTAIC ENERGY CONVERSION

In Its Res. in Energy Conversion 30 Sep. 1966 p 1-165 refs

Reported are results of studies on thermionic and photovoltaic energy conversion among which are cited studies of the response characteristics of silicon solar cells, the silicon single crystal film fabrication, energy conversion applications of hetero-junction diodes, thermodynamic aspects of photovoltaic devices, the properties of cathodes, and diffusion effects in silicon.

S.C.W.

N68-21331# Kernforschungsanlage, Juelich (West Germany). Institut fuer Technische Physik.

APPLIED MAGNETOHYDRODYNAMICS, NO. 3 [ANGEWANDTE MAGNETOHYDRODYNAMIK, HEFT 3]

T. Bohn, S. Foerster, K. Grawatsch, Chr. Holzapfel, G. Kolb et al Dec. 1967 75 p refs In GERMAN

(JUL-510-TP) CFSTI: HC \$3.00/MF \$0.65

This paper describes design and construction of the ARGAS experimental magnetohydrodynamic generator at this nuclear research facility. The argon-operated generator is used to study the factors affecting specific energy conversion and the properties of dense, weakly ionized gases in general. Experiments with helium and neon as the operating gas are also considered. A detailed description is given of generator layout, heater elements, jet with diffuser and magnet, heat exchanger, cesium loop, compressors, gas purifiers, control arrangements, and instrumentation.

Transl. by K.W.

N68-21439# General Electric Co., New York. Research and Development Center.

FUEL CELLS WITH MOLTEN-CARBONATE ELECTROLYTES

H. A. Liebhafsky and E. J. Cairns Jun. 1967 40 p refs

(Rept.-67-C-210)

Research efforts related to molten carbonate fuel cells are summarized by highlighting the work of several investigators, considering both aqueous and nonaqueous electrolytes, and predicting the future for practical batteries. It is noted that the great importance of natural gas has added significantly to the study of such fuel cells; and that with regard to power output, attainable gas utilization, and cell operating life, there appears to be a future for the high temperature fused carbonate cell. Economic feasibility of such batteries can be determined by conducting larger scale studies than are presently underway.

M.W.R.

N68-21480# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).

PROBLEMS OF ENERGY SUPPLY [PROBLEME DER ENERGIEVERSORGUNG]

W. Rasch In Tech. Hochschule Carolo Wilhelmina The Exploration of the Planet Jupiter Dec. 1967 p 128-146 ref

The feasibility and the advantages of using solar cells, radioisotope generators, fission electric cells, and thermionic converters as energy sources for Jupiter spacecraft are explored. Launch vehicle payload capacities, weight of the power systems, power densities, and the characteristics of important radioactive isotopes are evaluated. The resulting power efficiencies are applied to derive data transmission capabilities for the spacecraft.

Transl. by K.W.

N68-21597*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

THERMIONIC CONVERTER AND GENERATOR TESTS

P. Rouklove 1 Mar. 1968 15 p refs

(Contract NAS7-100)

(NASA-CR-94154; JPL-TR-32-1244) CFSTI: HC \$3.00/MF \$0.65 CSCL 10B

The results of tests of approximately 40 advanced-technology thermionic converters (all of planar geometry) and of 2 thermionic generators are presented, which were made to determine power output, maximum life, efficiency, and ability to withstand environmental stresses. Electron bombardment was used to simulate solar heating. In support of the converter and generator development ancillary experiments were performed to investigate (1) the reaction of alumina with molybdenum at high temperatures, (2) the accuracy of temperature measurements with different types of hollows with various L/D ratios, (3) the effects on the performance of a converter when enclosed in a generator configuration, and (4)

the relationship between the shape of the emitter and that of the filaments used in the electron bombardment. Improved test equipment enabled simpler operation and, also, provided greater accuracy in diagnostic measurements. It was demonstrated that the units assembled have increased power and long-term life and can stand the stresses of the Atlas/Agena launch environment.

Author

N68-21856# Technische Hochschule Stuttgart (West Germany). Institut fuer Kernenergetik.

RESULTS OF STUDIES ON THERMIONIC REACTOR SYSTEMS [ERGEBNISSE VON STUDIEN UEBER THERMIONIKREAKTOR SYSTEME]

R. Pruschek, S. Dagbjartsson, D. Emendoerfer, M. Groll, W. Haug et al [1968] 39 p refs In GERMAN; ENGLISH summary Presented at DGLR Symp. on Energy Provision in Space No. 2, Munich, 14 Mar. 1968

(Rept.-68-007) CFSTI: HC \$3.00/MF \$0.65

The following systems were studied: (1) thermal in-core thermionic reactors; (2) thermal double diode thermionic reactors; (3) fast in-core thermionic reactors; (4) fast heat pipe thermionic reactors; and (5) fast thermionic reactors with emitter heated by heat radiation. Such characteristics data as fissionable material requirements, power output, specific power, mass of components, and total mass are given. Problems of power flattening, long-time behavior, converter-nuclear heat source integration, and specific design features are discussed.

K.W.

N68-21974 Joint Publications Research Service, Washington, D. C.

ISOTOPIC ELECTRIC POWER SOURCES FOR RADIOMETEOROLOGICAL STATIONS

G. M. Fradkin, V. M. Kodykov, A. I. Ragozinskiy, Ye. A. Kazakov, N. P. Korotkov et al In its Studies in Fuel Elem. and Radioact. Isotopes 18 Apr. 1968 p 15-19 refs (See N68-21972 12-22)

Thermoelectric means are being used to convert the thermal energy released during decay of radioactive isotopes into electrical energy as a source of electric power for radio meteorological stations in the Soviet Union. An experimental isotopic generator called Beta 1 is described that uses cesium 144 and has a power of 5 W; and various modifications to this generator are also considered.

M.W.R.

N68-22013# Deutsche Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

ENERGY CONVERSION USING MAGNETOCALORIC AND ELECTROCALORIC EFFECTS [ENERGIEWANDLUNG MIT HILFE MAGNETOKALORISCHER UND ELEKTROKALORISCHER EFFEKTE]

Walter Peschka 1968 18 p refs In GERMAN Presented at the 2nd DGLR Symp. on Energy Supply in Interstellar Space, Munich, 14 Mar. 1968

(DGLR-68-005)

The principle of electrically conducting quasi-ferromagnetic liquids or suspensions is used to demonstrate that mechanical energy is also imparted to a non-ferromagnetic electrically conducting liquid when the working medium enters an alternating magnetic field in the vapor phase and then condenses. A portion of the heat required for vaporization occurs in the form of mechanical energy, i.e. increased pressure, and a magnetohydrodynamic (MHD) converter can be used to change the mechanical into electric energy. The process, in conjunction with regenerative heat exchangers and the MHD converter, can be adapted to the design of a thermodynamic loop which should be more efficient than condensing ejector systems without regenerative heat exchange. The application of electrocaloric effects in the conversion of heat into electric energy is briefly discussed.

Transl. by K.W.

05 ENERGY CONVERSION

N68-23140# Army Electronics Labs., Fort Monmouth, N. J.

POWER SOURCES FOR ELECTRIC CARS

Galen R. Frysinger Jan. 1968 42 p

(ECOM-2929; AD-666773)

An extrapolation, based on extensive experience with battery and fuel cell power sources during various Army programs, is made into the future world of the electric car and speculates on the power sources most suited as the electrical energy source. The conclusion is that both the battery and the fuel cell have their place when combined uniquely in a hybrid configuration which by proper design can provide outstanding characteristics. Author (TAB)

N68-23346 Stanford Univ., Calif.

PERFORMANCE CHARACTERISTICS OF A COMBUSTION-DRIVEN MAGNETOGASDYNAMIC POWER GENERATOR

Karl Gardner Reseck (Ph.D. Thesis) 1966 232 p

Available from Univ. Microfilms: HC \$10.60/MF \$3.00 Order No. 67-4421

A magnetogasdynamic generator designed to obtain direct-current electrical power generation data under thermally steady-state conditions operates on the combustion products of ethyl alcohol, oxygen, nitrogen, and KOH seed. The active part of the generator is 19-1/2 inches in length with a cross-sectional area of 1-1/4 inches width by 4 inches transverse height. Thirteen pair of water-cooled molybdenum electrodes insulated by MgO brick form the walls of the gas duct. Flow conditions consist of a stoichiometric mixture with a total mass flow rate of 0.36 kg/sec. Magnetic induction levels of 0, 0.48, 1.36, 2.03 and 2.64 tesla are used. Electron mobility ranges from approximately 0.5 m²/volt-sec in the hot gas core to 0.1 m²/volt-sec along the cool electrode surfaces. Gas core temperatures are approximately 2570°K and 2750°K, and estimated wall surface temperatures range from 1000°K on the electrodes to 24°K on the sidewall brick. Test durations in excess of one hour were used. Dissert. Abstr.

N68-24189# Siemens-Schuckertwerke A.G., Erlangen (West Germany).

DEVELOPMENT OF A THERMOELECTRIC CONVERTER FOR A NUCLEAR ENERGY SYSTEM [ENTWICKLUNG EINES THERMOELEKTRISCHEN KONVERTERS FUER EIN NUKLEARES ENERGIEVERSORGUNGSSYSTEM]

E. V. Szabo Feb. 1968 69 p refs In GERMAN; ENGLISH summary. Sponsored by Bundesmin. fuer Wiss. Forschung (BMWF-FBW-68-10) CFSTI: HC \$3.00/MF \$0.65

During the development of a thermoelectric converter for a nuclear energy supply system recently studies were made of the production of semiconductors by sintering, the electrical conductivity of shoe materials, the compressive strength of complete generators components and the electrical insulation and fixing elements on the hot and cold side. The focal point of the work was the design of a converter featuring an alternately stacked ring-tube system for the hot and cold side with modular generator elements and heat transfer by liquid metal in a counter-flow arrangement. Advantages: simple assembly and wiring, uniform pressure on the modules and simple matching to the power requirements by extension of the system. Author

N68-24455# General Electric Co., Philadelphia, Pa. Missile and Space Div.

NIMBUS 2: PHOTOVOLTAIC POWER SYSTEMS ON FLIGHT SPACECRAFT

K. F. Merten, K. L. Hanson, and W. J. Schlotter 23 Feb. 1968 519 p refs

(Contract NAS7-547)

(NASA-CR-62045; Doc. 68SD4222) CFSTI: HC \$3.00/MF \$0.65 CSCI 10B

Design and performance of the photovoltaic power system in the Nimbus 2 spacecraft are detailed from the viewpoint of the needs of a power system design engineer. Following descriptions of the Nimbus project, the power system, and overall power system management, descriptions are given of the solar array, battery modules, electronics module, and other components. Design performance requirements are detailed in terms of the subsystems, solar array, battery, and electronics module. General environmental test requirements are included; and design qualification and/or acceptance requirements are given for the sensory ring components; stabilization and control subassembly and components; solar array component boards, motor and latching mechanism, platforms, and assembly; and the Nimbus A and Nimbus C spacecraft. The power system design qualification and flight acceptance test programs are detailed; ground test and flight performance are described; and electrical/electronic parts lists are included. Costs and significant technical problems are noted, as are the prediction of space output of the Nimbus 2 solar array and effects of long term storage on the power system. M.W.R.

N68-25016# United Kingdom Atomic Energy Authority, Culham (England). Research Group.

ECONOMIC GENERATION OF POWER FROM THERMONUCLEAR FUSION

R. Carruthers, P. A. Davenport, and J. T. D. Mitchell Oct. 1967 33 p refs

(CLM-R-85) HMSO: 4s 6d

Plasma confinement systems are examined as to their potential for satisfying plasma power balance requirements for electrical power generation from the D-T fusion reaction. From this analysis a steady-state toroidal system is taken as a model and engineering parameters are identified defining (i) the form and size of an economic fusion reactor; and (ii) the plasma confinement parameters which must be satisfied. Capital and generation costs for a power station based on this model are estimated and it is shown that the generation costs compare favorably with those from other possible energy sources. A similar study of a D-D reactor indicates that this could provide an economic power source though the confinement parameters are more stringent. These economic studies are used to identify technological problems requiring investigation. Author (NSA)

N68-26381# Brookhaven National Lab., Upton, N. Y.

POLLUTION-FREE HYBRID FOSSIL-NUCLEAR FUELED MHD POWER CYCLE

M. Steinberg, J. R. Powell, M. Beller, and B. Manowitz [1968] 51 p refs Presented at the Conf. on Intern. Energy Conversion Eng., Denver Sponsored by AEC

(BNL-12319; CONF-660837-1) CFSTI: HC \$3.00/MF \$0.65

A hybrid power plant is developed based on a hydrogen-oxygen combustion MHD cycle. Hydrogen is generated by reforming fossil fuel with nuclear generated steam and oxygen is obtained from air in an air separation plant. Steam is injected into the combustion gases to control temperature and pressure through the duct. A preliminary parametric study of the cycle efficiency and MHD characteristics is made with steam and helium as diluent. Overall thermal efficiencies of 55% appear practical with nuclear energy contributing 38% and coal 62% to the power cycle. The hybrid system allows the use of fossil fuel in a pollution-free plant; conventional water and gas-cooled nuclear reactors can be utilized in an MHD cycle; thermal pollution is significantly decreased; a clean MHD duct is provided. Author (NSA)

N68-26537# Stanford Univ., Calif. Plasma Gasdynamics Lab.

BOUNDARY PHENOMENA IN MHD GENERATORS

Summary Report, 15 Feb. 1966-15 Feb. 1968

R. H. Eustis, E. Mitchner, and C. H. Kruger 15 Feb. 1968 20 p refs

(Contract AF 49(638)-1695)
(AFOSR-68-0859; AD-668454)

The investigations included in this research are as follows: Experiments on turbulent Hartmann flow in plasmas; Turbulence suppression in magnetohydrodynamic flows; Nonuniform electrical conduction in magnetohydrodynamic channels; Electrostatic probe theory and application in a high-temperature, collision-dominated, potassium-seeded argon plasma; Electron transport coefficients for two-temperature plasmas; Necessary conditions for the validity of the two-temperature plasma model; Experimental electrode current distributions in MHD channels; The influence of boundary layers on spectroscopic temperature measurements in MHD channels; Discharge characteristics in a seeded plasma flow. Author (TAB)

and electrically regenerative systems, as the weight, complexity, and low efficiency of the photo, nuclear, and redox systems discourage their use as space power supplies. It is pointed out that the thermally regenerative system is heavier than such dynamic devices as the Brayton cycle, especially at high power levels; however, the smaller radiator area requirement might make it suitable for missions where the radiator areas must be small and where low voltage direct current is needed. Although the specific weight, cycle life, volume, and efficiency of the electrically regenerative systems are well below those projected for high energy density batteries, such advantages as its ability to be sterilized, the easy state of charge indication, and its capability for operation in very long cycles may result in some applications such as the lunar surface operation missions. M.G.J.

N68-26786# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

DIRECT COMPARISON OF VARIOUS FORMS OF ENERGY INTO ELECTRIC AND MECHANICAL POWER

G. N. Alekseyev 20 Jul. 1967 270 p refs Transl. into ENGLISH of the book "Neposredstvennoye Prevrashcheniye Razlichnykh Vidov Energii v Elektricheskuyu Mekhanicheskuyu" Moscow, Gosenergoizdat, 1963 p 1-336

(FTD-MT-64-355; AD-668263)

Contents: Direct conversion of chemical energy to electrical energy (Theory of fuel cells, Fuel cells with solid fuel, Fuel cells with gaseous fuel, Combined (solid-gas) fuel cells, Fuel cells with liquid fuel, Oxidizing reducing cells, Possibilities of application of fuel cells); Direct transformation of thermal energy into electrical and mechanical energy (Thermoelectric generators, Vacuum thermionic emission electric generators, Gas-filled thermionic emission electric generators, Plasma thermionic emission electric generators, Certain general questions for thermionic electric generators, Information on magnetohydrodynamics, Magnetohydrodynamic electric generators, Electrorocket motors); Direct transformation of nuclear energy into electrical and mechanical energy (Radioisotope electric generators, Nuclear radioisotope motors, Nuclear reactor electric generators, Nuclear reactor motors, Thermonuclear electric generators, Thermonuclear motors); Direct transformation of solar energy into electrical and mechanical energy (Solar electric generators, Solar sail, Photon rocket motor). TAB

N68-28738# AEG-Kernenergieanlagen, Hamburg (West Germany).

SYSTEMS CONSIDERATIONS USING FUEL CELLS

Eckehard F. Schmidt In AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 756-799 refs

As physically and chemically different types of fuel cells require different subsystems and different methods of system integration, the optimum design of power supply systems using fuel cells is discussed in the context of overall systems considerations. Various energy conversion methods are described, and an energy flow chart for fuel cell systems is discussed and compared with a flow chart of a diesel engine. Based on an assessment of energy conversion systems technology, the following order of priority for future development work is recommended: (1) technical improvement of procedures for the generation of hydrogen, (2) optimization of the auxiliary aggregates of the total system, and (3) development of fuel cells which can use raw hydrogen, and which are suitable for direct operation using cheap hydrocarbons. M.G.J.

N68-28748*# National Aeronautics and Space Administration, Washington, D. C.

FUTURE APPLICATIONS FOR STATIC ENERGY CONVERSION DEVICES

William H. Woodward In AFSC Performance Forecast of Selected Static Energy Conversion Devices [1967] p 1128-1154
CSCL 10A

As no one electric power generation system can meet all of the current and future space power requirements, eight static and dynamic systems are proposed as the systems of principal interest for the next 5 to 10 years. These include solar cells, isotope thermoelectric, isotope Brayton, reactor thermoelectric, reactor Rankine, reactor thermionic, batteries, and fuel cells. The probable power range and estimated technology ready dates for these systems are tabulated. Also listed are the average power level and duration for 12 potential unmanned science probe and orbiter missions, 9 potential manned missions, 8 potential unmanned application satellite missions, and 13 unmanned science landers and electric propulsion. It is estimated that an additional two to eight years of development will be needed to configure and qualify a specific system for a specific mission. M.G.J.

N68-28714# Air Force Systems Command, Wright-Patterson AFB, Ohio. Air Force Aero Propulsion Lab.

PERFORMANCE FORECAST OF SELECTED STATIC ENERGY CONVERSION DEVICES

George W. Sherman, ed. and Lee Devo, ed. [1967] 1168 p refs Papers presented at the 29th Meeting of AGARD Propulsion and Energetics Panel, Liege, 12-16 Jun. 1967 Published for AGARD

CFSTI: HC\$3.00/MF\$0.65

Conference papers on static energy conversion devices for spacecraft power center on state-of-the-art reviews, technological developments, and performance predictions for batteries, fuel cells, and solar cells. For individual titles, see N68-28714 through N68-28748. M.G.J.

N68-28735# Air Force Systems Command, Wright-Patterson AFB, Ohio.

REGENERATIVE FUEL CELLS

Robert L. Kerr In its Performance Forecast of Selected Static Energy Conversion Devices [1967] p 658-715 refs

Problems which have delayed the development of the regenerative fuel cells are examined, and current technology and possible future advancements and applications are discussed. Attention is centered on the development potential of the thermally

N68-29063# California Univ., Livermore. Lawrence Radiation Lab.

REPORT OF THE AD HOC PANEL ON FUSION RESEARCH ON LOW-BETA PLASMAS CONFINED IN OPEN-ENDED GEOMETRIES

T. K. Fowler, George Bekefi (MIT), Harry Dreicer (Los Alamos Sci. Lab., N. Mex.), G. E. Guest (Oak Ridge Natl. Lab., Tenn.) W. A. Perkins et al Mar. 1968 55 p refs Sponsored by AEC

05 ENERGY CONVERSION

(TID-24254) CFSTI: HC \$3.00/MF \$0.65

The committee reviewed the AEC open ended low beta plasma programs. Recommendations are discussed. NSA

N68-29921* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NUCLEAR REACTOR SPACE POWER CONVERSION SYSTEMS

Roger F. Mather 1968 13 p Presented at Triann. Power Conf., Chicago, 8-10 Apr. 1968; Sponsored by AFOSR

(NASA-TM-X-52472) CFSTI: HC \$3.00/MF \$0.65 CSCL 18L

The principal systems now being investigated for converting heat from advanced nuclear reactors to electrical power for manned and unmanned spacecraft are discussed. These power conversion systems are the Rankine and Brayton turboalternator, magnetohydrodynamic, and thermionic. The basic operating principles and development status are described for each of these systems. System efficiencies, applicable power levels, development problems and other characteristics are briefly reviewed. Author

N68-29960* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL EVALUATION OF A VOLTAGE REGULATOR-EXCITER FOR A 15 KILOVOLT-AMPERE BRAYTON CYCLE ALTERNATOR

Gary Bollenbacher, Richard A. Edkin, and Dennis A. Perz Washington Aug. 1968 31 p refs

(NASA-TN-D-4697) CFSTI: HC \$3.00/MF \$0.65 CSCL 10A

A voltage regulator-exciter for a 15 kVA, 120/208 volts, 400 hertz alternator was experimentally evaluated. Emphasis was placed on the effect of the voltage regulator-exciter on the alternator performance. Specific items tested include the voltage regulator-exciter output capacity, its regulating capability, its effect on alternator waveshape, and its performance during transient and startup conditions. Author

N68-29990 Arkansas Univ., Fayetteville.

MAGNETOHYDRODYNAMIC STUDIES IN CYLINDRICAL SYSTEMS WITH POWER GENERATION APPLICATIONS

Martin Jack McCutcheon (Ph.D. Thesis) 1967 135 p

Available from Univ. Microfilms: HC \$6.40/MF \$3.00 Order No. 67-12884

The analysis of an annular induction magnetohydrodynamic generator from a field theory approach has been made in order to determine the phase impedance, the power factor and the performance characteristics for the model. The flow velocity is assumed constant in the analysis in order to uncouple the electromagnetic and hydrodynamic equations; the resulting solution accounts for the effects of curvature introduced by the geometry; both open channel flow and annular channel flow are considered. The generator phase impedance and power factor are presented in normalized scalable form in terms of the dimensions, excitation, and flow parameters. Several examples are given for both ionized gas and liquid metal flows which illustrate the performance levels which should be achieved with the generator. The results indicate that it may be feasible to construct an experimental generator with liquid metal as the working fluid. The development of a conductivity probe which can be used with an electric shock tube is described also. Dissert. Abstr.

N68-30018 West Virginia Univ., Morgantown.
CHARACTERISTICS OF A FINITE LENGTH M.H.D. TRAVELING WAVE CYLINDRICAL ACCELERATOR OR GENERATOR

Jerry Larkin Jester (Ph.D. Thesis) 1967 168 p

Available from Univ. Microfilms: HC \$7.80/MF \$3.00 Order No. 67-11788

The primary aim of this paper is to determine the characteristics of an electrodeless cylindrical traveling wave accelerator of finite length. Previous work in M.H.D. power generation has shown, particularly for A.C. electrodeless generators, that a major portion of losses are due to fringing effects related to the small number of wavelengths of the device. From practical considerations, it is desirable to maintain a reasonably short length for the accelerator or generator; on the other hand, the efficiency of these devices is particularly sensitive to fringing effects associated with short lengths. This theoretical study determines quantitatively the electrical efficiency of an accelerator or generator of length comprising any integral or fractional number of wavelengths of the primary coil windings. In the second part of the paper a solution is presented which determines the correction coils necessary to eliminate first order fringing losses. Numerical results are shown in terms of four basic non-dimensional parameters: namely the slip factor, magnetic Reynolds number, radius of the tube, and, finally, the length of the device. Dissert. Abstr.

N68-30162* Oak Ridge National Lab., Tenn. Thermonuclear Div.

ON THE FEASIBILITY OF POWER BY NUCLEAR FUSION

D. J. Rose May 1968 156 p refs

(Contract W-7405-ENG-26)

(ORNL-TM-2204) CFSTI: HC \$3.00/MF \$0.65

Power from nuclear fusion will be feasible if certain plasma physics and engineering problems can be solved simultaneously; Equilibrium plasma properties discussed here are the thermalization rates between ions, electrons, and fusion α particles; fuel burnup fractions for given electron and ion temperatures, given injection or heating energies, and specified plasma environmental conditions. The effect of the presence of α -particles and of unequal particle temperatures on plasma pressure and reaction rate are calculated. Typical operating conditions for a variety of plasmas typical of open or closed magnetic confinement systems are shown. New solutions to outstanding engineering problems are indicated, viz: a cellular niobium vacuum wall, cooled with lithium or fused salt; a beryllium or BeO pebble-bed moderator, with added graphite; magnetic stress supports of titanium. Many subsidiary problems are discussed. It is shown that fusion systems with output in the order of 10,000 electric megawatts may be economically attractive; cost of the fusion system "core" lies between \$10 and \$20/kWe, depending upon circumstances. The desired operating parameters in an open-ended fusion system many be achieved if the plasma pressure is a substantial fraction of the magnetic pressure, but not otherwise, and the task will be difficult. Closed magnetic field configurations will be more attractive, provided stability and system size problems can be satisfactorily resolved. The relevance of the studies to present fusion research is indicated. Author (NSA)

N68-30330* Stichting voor Fundamenteel Onderzoek der Materie. Jutphaas (Netherlands). Instituut voor Plasma-Fysica.

PLASMA PRODUCTION AND HEATING BY LASER RADIATION

F. P. Kuepper Feb. 1968 28 p refs Sponsored by EURATOM (NP-17453; Rept.-68-44)

A review of the present status of the theories and experiments of the production and heating of plasmas by laser radiation is given. This includes the problem of plasma confinement by external magnetic fields and by the laser radiation field itself. On the basis of the calculated models the possibility of the production of a thermonuclear plasma by laser radiation is discussed. It is concluded that with the present-day laser technology a thermonuclear plasma with a fusion energy release greater than the laser radiation energy may be produced on a time scale of nanoseconds. Author (NSA)

N68-30681# Utah Univ., Salt Lake City. Microwave Device and Physical Electronics Lab.

INVESTIGATION OF SYNCHRONOUS-WAVE RF TO DC CONVERSION Final Report, 1 Jun. 1966-31 Dec. 1967

D. C. Watson, R. W. Grow, and C. C. Johnson Apr. 1968 207 p refs

(Contract DA-28-043-AMC-02290(E))

(Rept.-4: UTEC-MD-68-006; ECOM-02290-F; AD-670083)

A device for converting microwave power into electrical power in either d-c or low frequency a-c form is investigated both theoretically and experimentally. An electron beam passes through a Cuccia coupler where it receives microwave power in the form of cyclotron rotation, then enters a region of decreasing magnetic field which accelerates the beam along the axis of rotation. The increased longitudinal kinetic energy is recovered as electric energy by a depressed collector. A simple kinematic analysis demonstrates that the Cuccia coupler can convert large amounts of microwave power into electron beam rotation. Although the inertial mass increase introduces some difficulties in Cuccia coupler operation, these difficulties are surmountable, and satisfactory coupler operation can be achieved for a relatively wide range of operating conditions. In most cases, relativistic operation is superior to that predicted classically. Four tubes and a gun-collector tester prototype were tested experimentally. The gun-collector tester prototype gave efficiencies from 36 percent to 75 percent. A fourth tube yielded measured efficiencies up to 34 percent, or when corrected to disregard cavity losses, up to 59 percent. Author (TAB)

N68-30760# California Univ., Livermore. Lawrence Radiation Lab.

CONCEPTUAL DESIGN OF A 10-MW SUB E NUCLEAR RANKINE SYSTEM FOR SPACE POWER

J. H. Pitts, ed., and C. E. Walter, ed. 30 Jan. 1968 43 p refs

(Contract W-7405-ENG-48)

(UCRL-50382) CFSTI: HC\$3.00/MF\$0.65

The conceptual design of a 10-MWe Rankine system for nuclear-electric space power is described. The system includes a compact nuclear reactor operating at 1650°K. The reactor design is based on uranium mononitride as the fuel, lithium as the coolant, and tungsten-25% rhenium as the structural material. An efficient heat-pipe radiator rejects waste heat at 1100°K. Overall system efficiency is 17.5%. Author (NSA)

N68-30811# National Aeronautics and Space Administration, Washington, D. C.

HIGH TEMPERATURE ENERGY SYSTEMS WITH PLASMA REACTORS AND INDUCTIVE MAGNETOPLASMA-DYNAMIC CONVERTORS (HOCHTEMPERATUR-ENERGIESYSTEME UNTER VERWENDUNG VON PLASMAREAKTOREN UND INDUKTIVEN MAGNETOPLASMA DYNAMISCHEN WANDLERN)

W. Peschka Jun. 1968 14 p refs Transl. into ENGLISH from Daut. Versuchsanstalt für Luft- und Raumfahrt, Inst. für Energiewandlung und Elek. Antriebe (Stuttgart), Sep. 1967 Rept. DLR-FB-67-59

(NASA-TT-F-11825) CFSTI: HC\$3.00/MF\$0.65 CSCL 201

This paper investigates possible future power generating equipment which operates with high temperature plasma as a working medium and subsequently with high power density. This temperature range requires reactors whose nuclear fuel is in the plasma state (fission or fusion reactors) coupled to magnetoplasma-dynamic generators acting as energy converters. Electrodeless MPD-generators with all their advantages can be successfully employed. The technological ramifications arising from the application of these high temperatures with respect to the reactors and the MPD-generators as well as to the heat release equipment are discussed. Author

N68-31042# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT OF A 1200-HERTZ ALTERNATOR AND CONTROLS FOR SPACE POWER SYSTEMS

B. D. Ingle and C. S. Corcoran 1968 14 p refs Presented at the Intersoc. Energy Conversion Eng. Conf., Boulder, Colo., 13-16 Aug. 1968

(NASA-TM-X-52453) CFSTI: HC\$3.00/MF\$0.65 CSCL 10B

For a 1200-hertz Brayton energy conversion system having a useful load rating of 10 kWe, an alternator and the associated voltage and frequency controls were designed and tested. The unique features in the components are: (1) the 36,000-rpm solid-rotor alternator designed to accommodate gas bearings; (2) pulse-type voltage regulator which is synchronized with the line frequency; and (3) multiple parasitic-loading speed control.

Author

N68-31544# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.

DESIGN STUDY (OF) ELECTRICAL COMPONENT TECHNOLOGY FOR 0.25 TO 10.0 MEGAWATT SPACE POWER SYSTEMS. PARAMETRIC DESIGN STUDY OF CANNED AC INDUCTION MOTORS

T. C. Allen 15 Dec. 1967 134 p refs

(Contract AT(04-3)-679)

(SAN-679-5; WAED-67.52E) CFSTI: HC\$3.00/MF\$0.65

Parametric studies of canned ac induction motors for prime movers of centrifugal pumps for space nuclear electric power plants utilizing the Rankine conversion cycle is presented. The parametric data is suitable to determine minimum system weight as a function of shaft horsepower rating, frequency, synchronous speed, voltage, and coolant temperature for ratings between 5 and 250 horsepower. Author (NSA)

N68-31787# Stanford Univ., Calif. Inst. for Plasma Research. EXPERIMENTAL ELECTRODE CURRENT DISTRIBUTIONS IN MHD CHANNELS

J. L. Kurz Apr. 1968 127 p refs

(Contract AF 49(638)-1695)

(SU-IPR-230; AFOSR-68-1298; AD-670527)

The distribution of current on the electrodes of a single-pair MHD channel was investigated experimentally. The experiments were performed with a flowing, atmospheric-pressure, alkali-metal-seeded argon plasma at temperatures between 1980K and 2150K for Hall parameter values up to seven. Two electrode configurations were investigated; one with the electrodes projecting into the flowing plasma, the other with the electrodes flush with the channel wall. Qualification measurements showed that the plasma free-stream conditions were uniform across the channel and in agreement with equilibrium calculations. Results for the anode current distribution were in all cases in good agreement with the theoretical predictions. The cathode current distribution was found to agree less well with the predictions. It was observed that the cathode current distribution for flush electrodes was considerably more uniform than for projecting electrodes. The anode voltage drop was consistently a small fraction of the total applied voltage for both electrode configurations. In contrast, the cathode voltage drop for the flush electrode channel was about four times that for the projecting electrode channel and constituted nearly 50 per cent of the total applied voltage. The cathode voltage drop was found to correlate reasonably well with the Schottky equation. Measurements made of the root-mean-square voltage fluctuations between voltage probes were consistent with the presence of magnetoacoustic and electrothermal waves. Author (TAB)

N68-31910# California Univ., Livermore. Lawrence Radiation Lab.

ONE-DIMENSIONAL CALCULATIONS ON A FINITE-LENGTH

05 ENERGY CONVERSION

MHD INDUCTION GENERATOR

M. Hausinkveld 11 Apr. 1968 41 p refs Presented at the Symp. on Magnetohydrodyn. Elec. Power Generation, Warsaw (Contract W-7405-ENG-48)

(UCRL-70795; Conf-680704-1) CFSTI: HC\$3.00/MF\$0.65

The problem of the finite length induction converter is solved in the slit channel approximation, in which the transverse magnetic field does not vary across the gap. The fluid channel is assumed to be infinitely wide, or infinite conductivity side shorting bars are assumed for a channel of finite width. Slug flow and scalar electrical conductivity of the channel fluid and sinusoidal time variation are assumed. The magnetic pole pieces with infinite magnetic permeability extend from $x = 0$ to $x = 1$. The basic equation for the total magnetic induction B_t is deduced from Faraday's law. Equations are obtained for electrical impedance of the excitation winding, hydrodynamic power input, real and reactive electrical power output, and the energy conversion efficiency. Predictions from this analysis are compared with experimental data from a linear converter model. Results of numerical calculations of the problem of a uniform traveling wave generator of finite length are presented. NSA

N68-31928# Avco-Everett Research Lab., Everett, Mass. ELEVENTH AFOSR CONTRACTORS' MEETING ON NON-CHEMICAL ENERGETICS: SUMMARIES OF RESEARCH

G. S. Janes [1968] 41 p refs Meeting Held in Boston, 20-22 May 1968

(Contract AF 49(628)-1553)

(AFOSR-68-1377; AD-671149)

Subjects reported include plasma diagnostics, magnetohydrodynamics acceleration and power generation, high temperature plasma production and containment related to controlled fusion, and charged particle accelerators related to physical energetics processes in energy and power sources and conversion. Research principal investigators and their affiliations are identified.

Author (TAB)

N68-32748# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.

DESIGN STUDY OF ELECTRICAL COMPONENT TECHNOLOGY FOR 0.25 TO 10.0 MEGAWATT SPACE POWER SYSTEMS. POWER CONDITIONING: PARAMETRIC SCREENING STUDY

E. F. Swiderski and John W. Gyurek 15 Sep. 1967 411 p refs

(Contract AT(04-3)-679)

(WAED67.45E; SAN-679-4) CFSTI: HC\$3.00/MF\$0.65

Results of the parametric studies to determine minimum system weight as a function of electrical component rating, voltage and frequency are presented on power conditioning and power distribution equipment for 0.25 to 10.0 MW space nuclear electric power plants utilizing the Rankine conversion cycle. The power conditioning and distribution equipment includes frequency changers, transformers, rectifiers, and transmission lines. The complete results on the parametric studies for the above equipment are presented.

Author (NSA)

N68-34481# Westinghouse Electric Corp., Lima, Ohio. ELECTRICAL COMPONENT TECHNOLOGY FOR 1/4 TO 10 MEGAWATT SPACE POWER

A. E. King, J. B. Fanger, and G. S. Leighton (AEC, Washington, D. C.) Aug. 1968 13 p refs Presented at 3d Ann. Intersoc. Energy Conversion Eng. Conf., Boulder, Colo., 13-16 Aug. 1968

(Contract AT(04-3)-674)

(CONF-680802-1) CFSTI: HC\$3.00/MF\$0.65

Analytical data are presented for electrical power system

components in advanced high-temperature, postassium Rankine nuclear space power systems. Power level and coolant temperature were used as independent variables to define combined minimum weight, maximum efficiency configurations based on an extensive background in the development of high temperature electrical materials, ac generators and motors, and power conditioning equipment for space applications. The data presented forecast electrical power system component design limitations and envelopes of minimum weight designs relative to such major systems parameters as temperature, shaft speed, voltage and frequency. Representative missions were analyzed for purposes of defining the ranges and types of electrical power needs and corresponding components. Author (NSA)

N68-35232# Navy Space Systems Activity, Los Angeles, Calif.

SPACE POWER SUPPLY STUDY Final Report

Richard V. Silverman May 1968 178 p refs

(NSSA-R40-68-5; AD-672772)

This report presents the results of a parametric analysis, evaluation and comparison of space electrical power systems capable of meeting a set of mission requirements. The parameters include: continuous power (300 or 600 W), peak power (2, 3.5 or 5 kW), duty cycle (5%, 10% or 20%) and mission duration (1 to 12 months). The spacecraft is defined to be in a low circular polar orbit and the power systems are to be available in the 1970-1973 time frame. Six types of power systems (solar cell/battery, fuel cell, fuel cell/battery, solar cell/battery/fuel cell, solar cell/fuel cell, and radioisotope thermoelectric generators/battery) were evaluated for possible application to such missions. Evaluation and comparison criteria include mass, volume, procurement costs, reliability and spacecraft integration factors.

Author (TAB)

N68-35442# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PARAMETERS OF MAGNETOHYDRODYNAMIC (MHD)-GEN- ERATORS TAKING INTO ACCOUNT IONIZATION INSTABIL- ITY OF PLASMA [PARAMETRY MGD-GENERATOROV S UCHETOM IONIZATSIONNOY NEUSTOYCHIVOSTI PLAZMY]

V. A. Gurashvili, Yu. Kareyev, and A. V. Nedospasov 6 Oct 1967 28 p refs Transl. into ENGLISH from IAE-1348 Rept.

(FTD-MT-24-205-67; AD-672686)

A discussion is given of calculations of MHD generators with unbalanced conductivity taking into account ionization instability. As a working medium argon and mercury vapor containing addition of cesium vapors are examined. Theory and experiment show that ionization instability is developed with such parameters of plasma which are assumed to be used in MHD generators with unbalanced conductivity. New approaches toward the selection of MHD generators are touched upon.

Author (TAB)

N68-36663# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF SUPERSONIC RADIAL NOZZLES FOR MHD-GENERATORS [ISSLEDOVANIYE SVERKHZVUKOVYKH RADIAL'NYKH SOPELDLYAMGD-GENERATOROV]

B. A. Tikhonov and V. R. Shevchenko 14 Oct. 1967 19 p ref Transl. into ENGLISH from Russian Rept. IAE-1347

(FTD-MT-24-208-67; IAE-1347; AD-672687)

Article discusses the results of the investigation of gas dynamics of radial (fan) supersonic nozzles. Experimental data are given on the influence of basic geometric dimensions of the radial nozzle on its gas-dynamic characteristics. Recommendations are given on the designing of shock-free radial nozzles with uniform field of speeds on the outlet. TAB

N68-35919# California Univ., Livermore. Lawrence Radiation Lab.

COMPUTATIONAL PROBLEMS IN PLASMA PHYSICS AND CONTROLLED THERMONUCLEAR RESEARCH

John Killeen 8 Jul. 1968 96 p

(Contract W-7405-eng-48)

(UCRL-71205) CFSTI: HC\$3.00/MF\$0.65

Numerical calculational methods for plasma physics are described for each of the following: pinch experiments, resistive instabilities, finite- β equilibria, Fokker-Planck equation, and the Vlasov equation. NSA

N68-37269# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN AND PRELIMINARY OPERATION OF THE LEWIS MAGNETOHYDRODYNAMIC GENERATOR FACILITY

Lester D. Nichols, James L. Morgan, Lawrence A. Nagy, Joseph M. Lamberti, and Robert A. Ellison Washington Oct. 1968 26 p refs

(NASA-TN-D-4867) CFSTI: HC\$3.00/MF\$0.65 CSCL 14B

The closed loop facility has been designed to study the feasibility of an argon-cesium MHD generator. The construction details, performance, and some preliminary research data are discussed. The facility has operated for several hours at the following conditions: argon flow rate, 1.8 kg/sec; Mach number, 0.3 to 0.5; stagnation temperature, 2100°K. Thus far, open circuit voltages equal to 60 percent of theoretical value (at 50 V) were measured. In addition short circuit currents up to 0.8 A (per electrode pair) were measured. This is in agreement with the calculated value using equilibrium conductivity. Leakage currents prevented better performance. Author

N68-37342# Arkansas Univ., Fayetteville. Plasma Lab.

ENERGY TRANSFER PROBLEMS IN SUPERCONDUCTORS AND FLOWING PLASMAS Final Report

Denys O. Akhurst, Martin J. McCutcheon, and Melvin K. Anderson Oct. 1967 259 p refs

(Contract DA-01-021-AMC-12820(Z))

(UAPL-31; AD-673292)

The final report on energy transfer problems in superconductors and flowing plasmas describes theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics. In the cryogenic studies, electrical energy is stored in superconducting coils and extracted with a 98% energy transfer efficiency. Theoretical support is given for the switching, storage and extraction results. In the magnetohydrodynamic studies, electrical energy is extracted from the high temperature plasma flow through a dc MHD generator. Included in the study is a survey of dc and ac MHD generators, an analysis of cylindrical ac MHD generators, and investigation of a pulsed induction ac MHD generator and the design and operation of a small scale dc MHD generator. Author (TAB)

N68-37410# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

RESEARCH AND ADVANCED CONCEPTS

In its Space Programs Sum. No. 37-51, Vol. 3 30 Jun. 1968 p 116-135 refs

Reported are research and advanced concepts related to the following: (1) laminarization in nozzle flow; (2) liquid-metal MHD (magnetohydrodynamic) power conversion; (3) the SE-20C thruster design; (4) radial distribution of enthalpy in a high temperature swirling flow; (5) effects of an applied, transverse magnetic field on heat transfer with swirling and nonswirling gas flow; and (6) effects of an applied, transverse magnetic field on wall pressure in a square channel. S.C.W.

N68-37951# Martin Co., Baltimore, Md. Nuclear Div.

SNAP 19, PHASE 3. VOLUME 3: GENERATOR DEVELOPMENTAL ASPECTS Final Report

May 1968 87 p refs

(Contract AT(30-1)-3607)

(MND-3607-239-3, V. 3) CFSTI: HC\$3.00/MF\$0.65

The purpose of SNAP-19 III Program is described. Thermoelectric couple development, component selection criteria and the module criterion are described. A description of development of advanced techniques for fuel handling, outgassing and leak testing generators is presented. Heater element and heater block development, including problems encountered and method of resolution are discussed. The configuration of generators tested, preparation for the tests and the tests; results of pre-endurance and endurance tests; evaluation of thermoelectric components and conclusions drawn from endurance tests are reviewed. Design features that provide reliability, and tests that provided reliability data are covered. The performance of Viton A as generator seals is discussed. Hot junction temperature measurement system, the problems experienced during its development and the means of problem resolution are discussed. Methods used in making neutron and gamma measurements, and spectra from these measurements are presented. The method of capsule support, problems encountered with support design and means by which problems were corrected are described. Author (NSA)

N68-38458# Institut für Plasmaphysik G.m.b.H., Garching (West Germany).

THE EFFECT OF THE ELECTRODE GEOMETRY ON THE CURRENTS AND POTENTIALS IN MHD GENERATORS [EINFLUSS DER ELEKTRODENGEOMETRIE AUF STROEME UND SPANNUNGEN BEI MHD-GENERATOREN]

M. Salvat Feb. 1968 16 p refs In GERMAN; ENGLISH summary

(IPP-3/68) CFSTI: HC\$3.00/MF\$0.65

The effect of the electrode segmentation on the performance characteristics of MHD generators was found by means of simple physical considerations. Simple expressions are derived which give the efficiency of an MHD generator as a function of the geometry and the Hall parameter. Author

N69-10111# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

RESEARCH IN THE CONVERSION OF VARIOUS FORMS OF ENERGY BY UNCONVENTIONAL TECHNIQUES Status Report for Period Ending 30 Jun. 1968

Manfred Altman Jun. 1968 78 p refs

(NASA-CR-97473; INDEC-SR-14) Avail: CFSTI CSCL 20

A transient solution to the heat conduction equation in a three layer composite cylinder was developed assuming perfect thermal contact between interfaces. Thermoelectric power, Hall coefficient, electrical conductivity, microhardness, and optical reflection measurements were made on $\text{CuCd}_2\text{InSe}_4$ and $\text{AgCd}_2\text{InTe}_4$. Data on the structure of tungsten films, on the effect of gas pressure on structure, and on tunneling were analyzed and summarized. Five porous ceramics and two millipore membranes were analyzed to define thermal transpiration flow, isothermal permeability, and heat conductivity. MHD measurements were made using a conducting fluid of liquid Hg with Na metal additive to increase wettability. Definite positive effects from the shape of the Pt Fermi surface were obtained; the results explained a large part of the structure of the Pt micrograph. Experimental apparatus was assembled for the purpose of obtaining transient overpotential data of a redox system (K ferricyanide and K ferrocyanide) on a rotating disk. Progress in specific areas of fuel cell design and performance are summarized. B.P.

05 ENERGY CONVERSION

N69-10335* Heat Engineering and Supply Co., San Gabriel, Calif.

DESIGN AND MANUFACTURE OF PARASITIC LOAD RESISTORS FOR BRAYTON POWER CONVERSION SYSTEM

Final Report

23 Jul. 1968 45 p

(Contract NAS3-10777)

(NASA-CR-72436) Avail: CFSTI CSCL 10B

Details are given on the design, manufacture and testing of Parasitic Load Resistors to dissipate 18 KWe electric power at 120 Volts and 1200 Hertz by converting the electrical energy to heat energy and radiating that energy to hard vacuum. Author

N69-11943# Joint Publications Research Service, Washington, D. C.

HEAT REGENERATION INJECTOR DESIGN EFFICIENCY AND SLOW PARAMETERS WEIGHED IN MHD INSTALLATIONS

28 Oct. 1968 61 p refs. Transl. into ENGLISH from the book "Magnitogidro-Dinamicheskiy Metod Polucheniya Elektronenenergii" Moscow, 1968 p 421-476

(JPRS-46752) Avail: CFSTI

CONTENTS:

1. THE THERMODYNAMICS OF MULTISTAGE CYCLES OF MHD INSTALLATIONS WITH HEAT REGENERATION E. E. Shpil'rayn et al p 1-10 refs

2. EXPERIMENTAL STUDY OF AN INJECTOR MODEL TO BE USED AS ACCELERATING DEVICE IN MHD INSTALLATIONS M. E. Deych et al p 11-21 refs

3. ON DETERMINING THE LOCAL PARAMETERS OF THE FLOW IN THE MIXING CHAMBER OF AN ACCELERATING DEVICE E. E. Shpil'rayn et al p 22-33 refs

4. METHODOLOGY FOR COMPUTING THE SIMPLEST INJECTOR M. M. Deych et al p 34-44 refs

5. EVALUATING THE EFFECTIVENESS OF LIQUID-METAL MHD INSTALLATIONS IN THE PRESENCE OF DISCONTINUITIES OF INJECTOR OPERATION IN THE MIXING CHAMBER OF THE ACCELERATOR V. F. Stepanchuk et al p 45-53 ref

N69-11944# Joint Publications Research Service, Washington, D. C.

THE THERMODYNAMICS OF MULTISTAGE CYCLES OF MHD INSTALLATIONS WITH HEAT REGENERATION

E. E. Shpil'rayn et al *In its* Heat Regeneration Injector Design Efficiency and Slow Parameters Weighed in MHD Installation 28 Oct. 1968 p 1-10 refs

Avail: CFSTI

The present paper examines and analyzes the cycles of fluid-metal power installations with a single-component working fluid. It outlines the principal causes resulting in low efficiency of the cycle when there is multistage introduction of cold fluid (in the injector system). Multistage systems are proposed for both the injector and the separation method of heat regeneration, making it possible to operate the power installation within a wide range of dryness levels. It is shown that the effective efficiency coefficient in such cycles ranges from 12 to 14%. Author

N69-12307*# Toronto Univ. (Ontario). Inst. for Aerospace Studies. **OPERATION OF AN MGD POWER GENERATOR** Concluding Report, 1 Jun.-30 Nov. 1967

Stanley J. Townsend 24 Oct. 1968 38 p refs

(Grant NGR 52-026-012)

(NASA-CR-72477) Avail: CFSTI CSCL 20I

A large, inert gas, blowdown, magnetogasdynamic power generation facility was constructed to produce a large volume and mass flow rate of seeded argon or helium plasma and to dispose safely of the high temperature, corrosive plasma after testing. The facility is versatile enough to apply this plasma to a wide variety of channel geometries with minimal changes in reconfiguration. With the completion of the installation and satisfactory testing of all components but the seeding and seed-removal systems, an increased effort is being placed on analytical and diagnostic studies of the plasma. A series of calculations was performed for a uniform flow of current through an infinite, argon/NaK-90 plasma, when the driving electric field is $U \times B$. A later study extended this to a solution of Laplace's equation in the channel where the boundary conditions are prescribed by a combination of electrodes, insulators and the free stream in the channel. Further modifications were introduced in this latter study to allow for strong gradients in electron temperature and pressure Author

N69-12577*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

TOPICS ON RANKINE CYCLE POWER SYSTEMS TECHNOLOGY

Martin J. Saari, Jack A. Heller, Robert G. Dorsch, Phillip L. Stone, Herbert G. Hurrell et al *In its* Selected Technol. for the Elec. Power Ind. 1968 p 35-89

Avail: CFSTI CSCL 18E

This article treats selected topics associated with that part of the Rankine power system that converts the thermal energy into the mechanical energy used to drive the electric generating equipment. The information has been obtained during efforts to develop power systems for space flight application. The space Rankine system is compared with ground-based power systems. Thermal design and stability of compact once-through boilers are discussed, including the double containment feature of the SNAP-8 boiler. The turbine blade erosion mechanism and the prediction of the erosion damage rate by analytical models are covered. Pump cavitation is discussed in terms of structural damage to the pump impeller, and pump technology and performance are reviewed. A brief material study compares the properties of a modified (Cr-1Mo) steel with other alloys and stainless steels. The value of computer simulation for the analysis of system transient behavior is summarized. K.W.

N69-12578*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

BRAYTON CYCLE SYSTEMS

Warner L. Stewart, William A. Benser, Arthur J. Glassman, Donald C. Guentert, and Robert O. Hickel *In its* Selected Technol. for the Elec. Power Ind. 1968 p 91-137

Avail: CFSTI CSCL 10A

The principles of the gas turbine engine are reviewed, particularly the performance improvements made through use of the advanced technology generated in the propulsion field. Special features of the cycle as applied to airbreathing power systems as well as closed loops, where gases other than air can be used, are described. Efficiency, stage loading, high temperature operations, turbine materials, and fuels of open cycles are discussed. The discussion of the closed cycles covers the inert gas and carbon dioxide cycles, pressure losses, recuperation, and working fluids. K.W.

N69-12585*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

DIRECT ENERGY CONVERSION

Harvey J. Schwartz and James J. Ward *In its* Selected Technol. for the Elec. Power Ind. 1968 p 281-303

Avail: CFSTI CSCL 10B

Four types of direct-conversion processes are discussed: electrochemistry, thermoelectrics, thermionics, and magnetohydrodynamics (MHD). Of these processes, the potential usefulness of the space-power electrochemical storage battery to the electric power industry is pointed out. The technical or economic shortcomings of fuel cells, thermionics, and MHD in their present state of development are indicated. Costs and efficiency data for all systems are given. K.W.

N69-13045*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RESULTS OF RESEARCH ON A SINGLE-COMPONENT SYSTEM FOR A LIQUID-METAL MHD CONVERTER

B. G. Bogomolov et al 1968 21 p refs Transl. into ENGLISH from Russian Conf. paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97883; SM-107/135) Avail: CFSTI CSCL 10B

Problems in designing single-component closed loop MHD converter using potassium are discussed. The thermodynamic cycle is analyzed, and the two-phase nozzle design is discussed which is dependent on a semi-empirical method. Studies were made of the mixing chamber using a monojet and water, and observations were made by sampling the flow pressure and temperature, visually and with photographs and oscillographs. The effects of injection speed, vapor dryness, vapor temperature, and other parameters on operation of the MHD converter were investigated. The closed flow system is shown to be easily controlled and to be stable, and the effect of the change in power fed to the steam generator on flow pattern is described. N.E.N.

N69-13069 Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.

PLASMAS AND CONTROLLED NUCLEAR FUSION

In its Res. Lab. of Electron. 15 Oct. 1967 p 73-134 refs (See N69-13060 03-34)

(Grant NSF GK-1165)

Avail: CFSTI

Research is reported on: (1) system C, (2) computer models of the beam-plasma interaction, (3) thin electron beam interactions with ions in a plasma-filled waveguide, (4) alternative stability analyses, (5) dynamics of the plasma boundary, (6) interactions of a spiraling electron beam with a plasma, (7) low-field microwave emission from contactless indium antimonide samples, (8) and hollow-cathode arc plasma. NSA

N69-13151*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THERMODYNAMIC ANALYSIS OF NEW CYCLES FOR LIQUID-METAL MHD GENERATORS

V. M. Boldyrev et al 1968 11 p refs Transl. into ENGLISH from Russian Conf. Paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97885; SM-107/142) Avail: CFSTI CSCL 10B

The problem of creating an acceleration device for an efficient liquid metal magnetohydrodynamic power plant is examined on the basis of separator and injector variants. Low internal efficiencies for the injector variant due to shock losses were analyzed, and literature advocating the use of a multistage injector cycle to eliminate the losses was reviewed. It is concluded that such a cycle will operate efficiently only after losses due to irreversible mixing of flows with substantially different temperatures are eliminated as well as those due to shock. Suggestions are made for the improvement of the thermodynamic multistage cycles with regeneration as related to three variants: a multistage separator

plant with regenerative preheaters; a multistage injector plant with condensation of the vapor phase at optimum vapor and liquid velocities; and a multistage injector-separator plant using wet metal vapor. A.C.R.

N69-13240*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE EFFECTIVE ELECTRICAL CONDUCTIVITY OF A TWO-PHASE LIQUID-METAL FLOW

N. D. Gavrilova, L. D. Dodonov, and I. T. Aladyev 1968 6 p refs Transl. into ENGLISH from the Russian Conf. Paper Presented at the Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97872; SM-107/153) Avail: CFSTI CSCL 10B

The hydrodynamics of a two phase vapor potassium flow for MHD generation of electric power are studied by comparing experimental results on two-phase flow conductivities. It is shown that the ponderomotive forces in the two-phase flow, acting basically on the liquid metal, increase the slippage of the phases and the carrying away of the liquid from the boundary layer film to the vapor nucleus of the flow increases in the diffuse-annular structure; at the same time the conductivity of the flow decreases. G.G.

N69-13286*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL INVESTIGATION OF AN INJECTOR DEVICE

V. S. Danilian et al 1968 9 p refs Transl. into ENGLISH from Russian conf. paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97878; SM-107/143) Avail: CFSTI CSCL 10B

The basic purpose of the work is to study the features of the characteristics [i.e. performance] of an injector using wet steam [vapor]. These investigations are of interest in connection with the fact that thermodynamic analysis shows that the optimum efficiency cycles of liquid-metal MHD plants [installations] must be accomplished on fairly wet steam. The operation of a wet steam injector along with the mixing chamber and diffuser [exit cone] includes the necessity of studying the operation of the steam [vapor] nozzle. This study is suitable both for conducting the study on a nozzle alone and on a nozzle coupled with the mixing chamber of the injector. Author

N69-13287*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INVESTIGATION OF TWO-PHASE LAVAL NOZZLES

I. T. Alad'yev et al 1968 7 p refs Transl. into ENGLISH from Russian conf. paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97877; SM-107/158) Avail: CFSTI CSCL 10B

A two-phase supersonic nozzle is an essential element of any liquid-metal MHD-generator scheme. At the present time there is no strict theory for such a nozzle, and existing methods for approximation calculations are based on many simplifications the validity of which are not at all clear. On the other hand, experimental investigations of two-phase nozzles are extremely limited and, in addition, contain information pertaining to a particular case. The accumulation of experimental data on two-phase nozzles, at the present stage, is an important problem. Some results of the experimental investigation of two-phase nozzles completed in a Heat Exchange Laboratory are presented. Author

N69-13288* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
EXPERIMENTAL INVESTIGATIONS ON LIQUID-METAL MHD GENERATORS

05 ENERGY CONVERSION

G. A. Baranov et al 30 Jul. 1968 10 p refs Transl. into ENGLISH from Russian conf. paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968

(Contract NAS7-100)

(NASA-CR-97879; SM-107/136) Avail: CFSTI CSCL 10B

MHD generators due to the large velocities of the liquid-metal working medium have hydraulic losses in the ducts that comprise a considerable part in the total balance of power. The tendency has been noted to decrease the length of the operating ducts of the generators. However, end effects begin to appear associated with the openness of the magnetic system of linear generators, which leads to a sharp deterioration in their operating performance [characteristics]. A number of known methods of improving the performance of short generators are based on the equalization of the magnetic field in the gap along the duct and in the correct field shaping in the input and output zones of the working medium into the field. These questions were experimentally investigated on plane AC and DC linear generators. Work was performed in the selection of optimal duct geometry from the point of view of reducing their hydraulic resistance, and generators of the helical type were investigated where the end effects appear considerably weaker.

Author

N69-13315# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDIES OF ELECTRODES IN AN MHD GENERATOR [ISSLEDOVANIYE ELEKTRODOV V MHD GENERATORE]

V. C. Bzozovski et al In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 1-10 refs

(SM-74/62) Avail: CFSTI

Four different types of ceramic and metallic electrodes were studied in an MHD generator. Experiments were made on temperature of electrodes, their stability and erosion.

Author

N69-13317# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A METHOD OF OPTIMIZATION OF THE CONSTANT CURRENT ELECTROMAGNET IN AN MHD GENERATOR [METODIKA OPTIMIZATSII ELEKTROMAGNITA MGD GENERATORA POSTOYANNOGO TOKA]

Iosif Shank In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 26-43 refs

(SM-74/83) Avail: CFSTI

The dependence of the specific computed costs and of the specific power of the electromagnet on the magnitudes of the magnetic induction $\beta(O)$ in the air gap and the current density σ in the windings for the optimum variants was studied. This dependence forms the basis for the optimization of the MHD generator and the MHD power station. From the point of view of economy the results obtained are favorable. They show that ferromagnetic electromagnets certainly have their place in MHD generators. However, it must be remembered that these results are relative if it is considered that the MHD method of energy conversion, at the present stage of development, has accomplished only the first step towards industrial utilization.

Author

N69-13319# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF ELECTRODES MADE REFRACTORY METALS FOR MHD GENERATORS UTILIZING NONEQUILIBRIUM CONDUCTIVITY [ISSLEDOVANIYE ELEKTRODOV IZ

TUGOPLAVKIKH METALLOV DLYA MGD GENERATOROV S NERAVESNOY PROVODIMOST'YU]

V. T. Karpukhin et al In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 60-68 refs

(SM-74/92) Avail: CFSTI

Results are described of experimental investigation of the emission characteristics of certain refractory metals and their alloys in a discharge, and of the investigation of the current distribution along the electrode surface and its dependence on the magnetic field. An estimate showed that for a current density of 1 to 5 amp/cm² in the channel of a Faraday type MHD generator with maximum segmentation of electrodes, the density of emission from separate electrode surfaces may increase to a few tenths amperes/cm². It is known that for generators utilizing nonequilibrium conductivity of the working substance, the requirement of uniformity of current in the generator volume is very important. All plasma inhomogeneities lower the output power of the generator. Therefore, uniform emission from the electrode surface is especially important. An analysis of the S-shaped emission curves of different refractory materials in the presence of cesium vapor, shows that at temperatures of the order of 1200 to 1500°K, thermionic current densities of a few tenths amperes/cm² are not possible. For this reason experiments were set up to determine the magnitude of the discharge current from the electrode surface as a function of the cathode material, its temperature, and the vapor pressure of cesium. The experiments were conducted on mercury-cesium and argon-cesium discharge.

Author

N69-13324# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STUDY OF THE NONEQUILIBRIUM CONDUCTIVITY OF A PLASMA IN AN MHD GENERATOR [ISSLEDOVANIYE NERAVNESNOY PROVODIMOSTI PLASMA V MAGNITOGAZODINAMICHESKOM GENERATOR]

M. I. Afanas'yev et al In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 113-119 refs

(SM-74/104) Avail: CFSTI

Under certain physical conditions the temperature of plasma electrons may be considerably higher than that of the ions and neutral particles. Such a state of thermodynamic nonequilibrium may be produced in the duct of an MHD generator by heating the electrons with the aid of an electric field induced by the plasma flowing transversely through a magnetic field. This leads to a considerable increase in the electrical conductivity of the plasma and in the power density of the MHD generator. Experiments were carried out on an MHD generator model. The inert gas was heated by means of dc plasmatrons. Measured amounts of an alkali metal were added in the liquid phase to the gas up to the point when the latter passed through the arc discharge region. From the intermediate chamber the low-temperature plasma passed into the accelerating nozzle and then entered the linear MHD duct. Continuous and segmented electrodes were used in the MHD duct. The static pressure in the duct was 1 atm abs or higher. The velocity of the working fluid varied in both the subsonic and the supersonic regions. The gas temperature varied over a wide range. The different physical characteristics of the plasma were measured simultaneously by spectroscopic, aero-dynamic and electrical methods.

Author

N69-13325# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME RESULTS OF EXPERIMENTS WITH A 100-KW MH MHD GENERATOR MODEL [NEKOTORYYE REZULTATY EKSPERIMENTAL'NYKH ISSLEDOVANIY 100-KILOVATTNOY MODELI MGD GENERATORA]

M. S. Berger et al In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators 14 Nov. 1968 p 120-131

(SM-74/212) Avail: CFSTI

Experiments were carried out with a model of a linear conduction MHD generator at fairly high levels of specific power, current density, and electric field strength. The MHD interaction was achieved in the fairly small model by raising the electrical conductivity of the working fluid by heating it to 3500 to 4500°K in an electric arc preheater. From the load characteristics the mean specific electrical conductivity of the gas under the experimental conditions were estimated: at the generator inlet—160 mho/m; at the generator outlet—75 mho/m. These values coincided with those computed for equilibrium conditions. Losses at the electrodes were 30 to 40 V in the initial sections of the model and 110 to 120 V in the final sections. The experiments did not reveal any fundamental limitations in the operation of the MHD generator on passing to higher specific parameters. Experimental conditions were achieved under which the MHD interaction in the generator duct became the determining factor, while end effects and phenomena occurring at the walls and at the electrodes were less important.

Author

N69-13327# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE EFFECTIVENESS OF ENRICHING AIR WITH OXYGEN IN INSTALLATIONS WITH MHD GENERATORS [OB EFFEKTIVNOSTI OBOGASHCHENIYA VOZDUKHA KISLORODOM V USTANOVKAKH S MGS GENERATORS]

G. I. Rossiyskiy et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 142-154 refs

(SM-74/201) Avail: CFSTI

In open cycle MHD generators using ordinary air for the combustion of fuel, the increase in the initial parameters of the cycle (deceleration temperature of the combustion products before entering the channel t_{01}) is limited by the possibility of regenerative heating of the air by the combustion products. For natural gas the limiting value of t_{01} is about 2700° C with the necessary air preheating temperature of 2000° C. At the same time the construction of a high temperature combustion products-air heat exchanger presents one of the main difficulties in achieving installations with open cycle MHD generators. The use of oxygen enriched air in MHD equipment would permit the solution of two problems: first, equipment with a moderate temperature of oxidant preheating would be achieved, and second, the initial temperatures of the cycle would be higher than with the use of ordinary air.

Author

N69-13329# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE EFFECT OF THE OUTPUT ON THE THERMAL EFFICIENCY IN ELECTRIC POWER STATIONS USING MHD GENERATORS [K VOPROSU O VLIYANII MOSHCHNOSTI ELEKTRICHESKIKH STANTSII S MGD GENERATOROM NAIKH TEPOVUYU EKONOMICHNOST]

G. I. Rossiyskiy et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 162-173 ref

(SM-74/204) Avail: CFSTI

The basic thermal scheme of an electric power station is examined in which the air is heated by gases coming out of the MHD generator and the residual heat of the combustion products (after heating the air) is utilized in the vapor turbine part of the power station. The overall efficiency of the power station with an MHD generator is determined by the efficiency of the MHD generator cycle and the vapor turbine part of the installation, which depends on the choice of the initial parameters of the vapor. At present this choice is almost unique because of the minimum

unit power of turbines. Higher initial parameters for the vapor turbines can be chosen only if their unit power is sufficiently high. Equipment with supercritical initial parameters of the vapor should be examined as possible replacements for vapor turbine power stations.

Author

N69-13331# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL INVESTIGATION OF THE MAGNETOHYDRODYNAMIC GENERATOR [EKSPERIMENTAL'NOYE ISSLEDOVANIYE MAGNITOGIDRODINAMICHESKOGO GENERATORA]

E. P. Strashnin et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 188-199 refs

(SM-74/206) Avail: CFSTI

Some results of investigations carried out in an experimental model of a linear MHD generator are discussed, on the combustion products of methane and oxygen seeded with an alkali metal salt. The MHD generator assembly consists of a combustion chamber, an operating channel, a magnetic system and associated equipment. The device is equipped with necessary measuring instruments. The combustion chamber is a cigar-shaped split structure with a detachable dispersal nozzle. The shape and dimensions of the nozzle vary, depending upon the particular problems to be investigated. A special feature of the combustion chamber is the jet ignition from a specially built-in diffusion burner, in which the gas and oxygen are tangentially fed from opposite directions. The ionizing impurity is introduced into the chamber by injecting an aqueous or alcoholic solution of an alkali metal salt. The combustion chamber is water-cooled and has an inner protective coating of fused magnesite. Liquid glass is used to provide the binding. The operating space of the combustion chamber is 8100 cm³ and the maximum flow rate of the combustible mixture is 300 gm/sec.

Author

N69-13332# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL INVESTIGATION OF VOLT-AMPERE CHARACTERISTICS OF A MAGNETOHYDRODYNAMIC CHANNEL WITH DIFFERENT ELECTRODES [EKSPERIMENTAL'NOYE ISSLEDOVANIYE VOLT-AMPERNYKH KHARAKTERISTIK MAGNITOGIDRODINAMICHESKOGO KANALA PRI RAZLICHNH ELEKTRODAKH]

E. P. Strashnin et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 200-209

(SM-74/209) Avail: CFSTI

The results are discussed of investigations of certain physical phenomena which occur in a channel operating on the combustion products of natural gas with oxygen at atmospheric pressure. The electrical conductivity of the plasma was sustained by ionizing additives which were introduced in the form of 20 to 40% solution of K₂CO₃ in water and KOH in alcohol. The experimental arrangement utilized a combustion chamber with flow rate of 200 gm/sec for the working mixture and with a matching nozzle which accelerated the plasma to a velocity of 500 to 600 m/sec. Different constructions of channels with ceramic lining were used. The voltage to the electrodes was supplied from a constant current generator.

Author

N69-13333# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTRICAL PARAMETERS OF A SYNCHRONOUS MAGNETOHYDRODYNAMIC GENERATOR WITH PULSATING ELECTRICAL CONDUCTIVITY OF MEDIUM [ELEKTRICHESKIYE PARAMETRY SINKHRONNOGO MGDG S PUL'SIRUYUSHEY ELEKTROPROVDNOST'YU SREDY]

05 ENERGY CONVERSION

L. G. Bezusyy *In its Intern. Symp. on Production of Elec. Power by means of MHD Generators* 14 Nov. 1968 p 210-220 refs

(SM-74/210) Avail: CFSTI

The initial model of the generator used is constructed on the basis of a number of simplifying assumptions relative to the nature of the flow, geometry of the channel, and electromagnetic properties of the materials involved. Unidimensional stationary flow of a noncompressible working fluid with a velocity $v = lv$; 0; 0 is assumed, directed along the axis of a rectangular channel of constant cross section. The channel has two conducting and two nonconducting walls. The nonconducting walls contact the surface of the poles of a dc electromagnet, creating a homogeneous excitation field across the channel. The potential difference across the conducting walls, depending on the design of the generator, is assumed equal to zero or a certain constant value; at first only the case of equal potentials corresponding either to a rectangular channel with short electrodes or to a coaxial channel which can be approximately replaced by a rectangular channel is analyzed. It is assumed that the magnetic circuit is made of a nonelectrical conducting material with infinite magnetic permeability, while the materials of the nonconducting wall and the working medium have magnetic permeability. Author

N69-13335# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMODYNAMICS OF A TWO-COMPONENT LIQUID METAL MHD POWER PLANT WITH AN INJECTOR [TERMODINAMIKA DVUKHKOMPONENTNOY ZHIDKO-METALLICHESKOY ENERGETICHESKOY MGD-USTANOVKI SINZHEKTOROM]

K. A. Yakimovich et al *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 233-243 refs

(SM-74/218) Avail: CFSTI

Among the schemes of MHD power equipment with liquid metal as the working substance, one in which a vapor-liquid injector is used for converting the thermal energy of the vapor into the kinetic energy of the liquid, has aroused considerable interest. This interest has resulted from the simplicity of construction of the converter and from the absence of moving parts in it; used in conjunction with the MHD generator (and if necessary with the electromagnetic pump), this converter can make the power equipment completely static. This last fact is very significant if the equipment is intended for a transport system. The problems related to the evaluation of the efficiency of the thermodynamic cycle with an injector and also of the efficiency of the vapor-liquid injector proper, were examined in a series of articles. Author

N69-13336# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CERTAIN PROBLEMS IN THE OPERATION OF A INSTALLATION WITH MHD GENERATOR [O NEKOTORYKH VOPROSAX RABOTY USTANOVOKS MGD-GENERATOROM]

V. A. Kirillin et al *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 244-257 refs

(SM-74/221) Avail: CFSTI

The most important problem of present day power engineering is that of increasing the economy of thermal and atomic power plants. This problem acquires special significance in the regions where the cost of fuel is high. One of the most obvious ways to obtain a steep increase in the initial temperature (which determines the economy of the installation) of the working substance in the thermal power plants, is the use of the magnetohydrodynamic method of converting thermal energy into electrical energy. This

method is highly promising in many other cases also, for example in installations with minimum overall characteristics, in equipment with large power transient operation, etc. Specific points related to the problem of building power plants using MHD generators with open as well as closed cycles are examined. Author

N69-13339# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PLASMA FLOW IN THE DUCT OF A "SERIES" MHD GENERATOR [O TECHENII PLAZMY V KANALA SERIYESNOGO MGD GENERATORA]

V. I. Kovbasyuk et al *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 272-279 refs

(SM-74/225) Avail: CFSTI

For Hall numbers comparable to unity, a series MHD generator has an advantage over Faraday, segmented, or Hall type MHD generators, since it admits of a high degree of electrode segmenting for a limiting number of different loads and gives a high conversion efficiency. The plasma flow in the generator duct has a number of special characteristics, determined by the changes in the physical properties of the working fluid along the duct and by changes in the local load factor for a given electrode configuration. A study is made of plasma movement in the duct of a series MHD generator. A general statement of the problem is formulated and conditions are determined for the validity of a quasi one dimensional flow model. Flow conditions close to the optimum are calculated and analyzed. Using a graphical analysis method a simple interpretation is given for the results obtained. Author

N69-13341# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

TRANSIENT PROCESSES IN SUPERCONDUCTING MAGNETIC SYSTEMS [PEREKHODNYE PROTSESSY V SVERKHPROVODYASHCHIKH MAGNITNYKH SISTEMAKH]

V. V. Sychev et al *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 288-301 refs

(SM-74/229) Avail: CFSTI

The possibility of using large superconducting magnets with rather high field intensities determines to a great extent the promise of effective usage of MHD installations in power engineering. In the creation of superconducting magnetic systems with tremendous working volumes, complex physical, technical, and engineering problems arise. The difficulties are not limited to the necessity of producing superconducting materials with high critical parameters. A number of extremely complex problems related to various areas of science and technology must be solved. In particular, one problem of prime importance is the investigation of the range of problems connected with the fundamental properties of the windings in a superconducting magnetic system as a physical object. Author

N69-13345# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMODYNAMIC CHARACTERISTICS OF HIGH TEMPERATURE OPEN CYCLES [TERMODINAMICHESKIYE OSOBENOSTI VYSOKOTEMPERATURNYKH OTKRYTYKH TSIKLOV]

G. M. Schegolev *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 328-337 refs

(SM-74/235) Avail: CFSTI

The high temperature open cycle, like the ordinary gas turbine cycle, can be represented on an entropy diagram. However, the extension of this cycle into a region of temperatures exceeding 2500°K creates some significant features in its operation. The

most important of these features are those related to the fact that the combustion products of the working substance undergo dissociation which can appear in the form of a significant increase in the specific heat. The specific heat of a dissociating gas can be considered as the sum of the ordinary specific heat and the specific heat induced by the effects of dissociative and recombination reactions. This specific heat is called the effective specific heat and like the degree of dissociation depends not only on the temperature, but also on the pressure. The examples presented show that purely thermodynamic analysis may prove to be a significant help in selecting the optimum cycle for a power plant using an MHD generator. Author

N69-13346# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN EXPERIMENTAL INVESTIGATION OF THE ELECTRICAL CONDUCTIVITY OF PLASMA IN AN MHD GENERATOR MODEL [EKSperimental'NOYE ISSLEDOVANIYE ELEKTROPROVODNOSTI PLAZMY NA MODELI MGDG]

N. M. Maslennikov et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 338-347 refs

(SM-74/236) Avail: CFSTI

At a gas temperature of 1300°K in the induced field, the experimentally measured electrical conductivity is 450 times greater than the equilibrium value of 0.068 mho/cm. Production of nonequilibrium electrical conductivity requires first of all that the proper density of the emission current from the cathode be provided in order to decrease the voltage drop in the layer around the cathode. Further increase in electrical conductivity is limited by the anode voltage drop. Highest possible increase in electrical conductivity requires that the optimum electrode length be selected. The relaxation of the electron temperature from the equilibrium value to the nonequilibrium value occurs over a short distance of the order of 0.3 cm. Author

N69-13347# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTRICAL ARCS IN IONIZED AND NON-IONIZED GAS STREAMS [ELEKTRICHESKAYA DUGA V POTOKE IONIZOVANNOGO I NEIONIZOVANNOGO]

V. Yu. Baranov et al. *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 348-359 refs

(SM-74/238) Avail: CFSTI

The experiments cited have shown that at small flow velocities the electric arc in the preionized gas can ensure sufficiently uniform ionization of the flow in the range of pressures which are of interest from the point of view of MHD generators. At velocities $\approx 10^5$ cm/sec an isolated transverse arc must burn in the breakdown regime and plasma from such a preionizer arrives in bunches. Although in principle conversion of electrical energy is possible with strongly modulated conductivity, this conversion is less efficient than in the case of uniform and sufficiently high conductivity. Author

N69-13348# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ON THE APPLICABILITY OF ELECTRODYNAMIC APPROXIMATION IN THE THEORY OF LIQUID METAL MHD ENERGY CONVERTERS [O PRIMENIMOSTI ELEKTRODINAMICHESKOGO PRIBLIZHENIYA V TEORII ZHIKOMETALLICHESKIKH INDUKSIONNYKH MGD-PREOBRAZOVATELEY ENERGII]

Ya. Ya. Liyepeter *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 360-371

refs

(SM-74/240) Avail: CFSTI

In the theory of liquid metal MHD induction converters the process of energy conversion is described under the assumption of plane parallel flow of the liquid metal in the channel of the machine, i.e., the problem is treated in electrodynamic approximation. In this approximation the basic electromagnetic characteristics of the converter, the power transferred from the liquid metal to the stator or from the stator to the liquid metal, the power factor, the efficiency, and so on, can be obtained relatively simply. The results show that the main reason for the disagreement between the observed and computed values of the operating characteristics of MHD induction converters is the difference between the computed and actual values of the electromagnetic pressure and not the traveling field effect on the flow structure and the increase in the hydraulic loss. This conclusion is valid for converters with relatively long channels where reversible hydraulic processes along the channel length can be neglected. Author

N69-13350# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE PROBLEM OF DETERMINING THE DIMENSIONS OF AN MHD CHANNEL [K VOPROSU O DIMENZIONIROVANII MGD-KANALA]

I. D. Urusov *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 388-404 refs

(SM-74/242) Avail: CFSTI

Usually the first step in designing rotary electric machines is to solve the problem of dimensions, i.e., to make a choice about the main dimensions (diameter of the hollow portion, length of the active part of the machine). The final choice, subject to certain optimum conditions, enables one to carry out the subsequent detailed computations by a more precise definition of specific parameters and characteristics, necessary for working out the technical plan of the electrical equipment and its technical-economical indices. An analogous problem of determining the dimensions arises also in sketching the design of a power plant containing MHD generators. It is necessary to have preliminary reference data for these generators at the initial stage in order to do the subsequent planning and to be able to make the technical-economical comparison of the variants of the entire power complex. A change in the electrical conductivity of the working gas significantly affects the length and the volume of the channel. By using the power law dependence for the electrical conductivity of the working gas, it is possible to take into account the effects of the pressure. Author

N69-13352# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SPATIAL EFFECTS IN MHD CHANNELS WITH SEGMENTED ELECTRODES [PROSTRANSTVENNYE EFFEKTY V MGD-KANALE S SEKTSIONIROVANNYMI ELEKTRODAMI]

I. M. Tolmach *In its Intern. Symp. on Production of Elec. Power by Means of MHD Generators* 14 Nov. 1968 p 417-430 refs

(SM-74/248) Avail: CFSTI

The distribution of the current density along the electrode in an MHD channel with two electrodes was studied. For this purpose one of the end electrodes was divided into a number of segments separated by insulators. All the segments had the same potential and it was possible to measure the current flowing into each segment, by a loop oscillograph. The cross section of the channel was 15.9×15.9 mm², the length of the electrode, 50.8 mm; the current flowing into the entire electrode was 0.8 amp. The Hall parameter was equal to unity in all the modes. The spacing between the segments was 1.06 mm. The ratios of the measured current flowing into segments 1, 2, and 3 to the total current (0.8 amp) are designated by points for different modes of

operation of the channel. Since the current flows in all the segments, in all probability the process in the layer adjacent to the electrode did not involve arcing; this absence of arcing would bring the experimental condition close to the formulation of the theoretical problem.

Author

N69-13391*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
INVESTIGATION OF A LIQUID-METAL JET MHD GENERATOR

K. I. Dmitriyev et al 1968 8 p refs Transl. into ENGLISH of a Russian paper presented at Symp. for the Generation of Elec. Power by Means of MHD Generators, Warsaw, 24-30 Jul. 1968 (Contract (NAS1-100)

(NASA-CR-97864; SM-107/134) Avail: CFSTI CSCL 10B

The use of a free liquid-metal jet emitted from an accelerating nozzle with a velocity of ≈ 100 -150 m/s for converting kinetic energy into electrical energy makes it possible to reduce several times over the friction losses in the generator and to eliminate completely the losses in the conducting walls of the duct. However, the extraction of power from a free jet depends essentially on its stability in crossed magnetic and electric fields. The paper deals with an experimental study on the use of a free jet for MHD energy conversion. The results are given of experiments with a jet MHD generator employing a liquid-metal sodium circuit under different operating conditions (no-load, short-circuit, various loads).

Author

N69-13670# Joint Publications Research Service, Washington D. C.
IONOSPHERIC MHD GENERATOR

P. Poletavkin 25 Nov. 1968 19 p Transl. into ENGLISH from Nauka i Zhizn' (Moscow), no. 9, 1968 p 34-40 (JPRS-46941) Avail: SOD/CFSTI

A method of producing electric power is proposed based on the use of solar radiation, thereby making it possible to maintain the equilibrium between the energy radiated by the earth and the energy received from the sun. The operating principles of a magnetohydrodynamic (MHD) generator are discussed to show that the occurrence of an electric current in ionospheric plasma is similar to the action of a MHD generator. Ways of utilizing this solar energy by means of an ionospheric MHD generator are assessed, and the view is offered that this generator is a natural electrical machine having a constant electrical current with a strength of about a million volts.

M.G.J.

N69-13818*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF AN INDUCTION-TYPE LIQUID-METAL MHD GENERATOR

Yu. A. Bakanov et al 30 Jul. 1968 12 p refs Transl. into ENGLISH from Russian Conf. Paper Presented at Symp. on the Production of Elec. Energy by Means of MHD-Generators, Warsaw, 24-30 Jul. 1968 (Contract NAS7-100)

(NASA-CR-97876; SN-107/160) Avail: CFSTI CSCL 10B

Details are given on the construction and testing of a three-phase liquid potassium magnetohydrodynamic generator, which was developed to experimentally verify theoretical statements assumed in designing the generator. Using the optimized calculation, basic dimensions of the generator were selected, such as pole division, number of poles, active length, gap in the liquid metal, number of turns of the helical duct, and transverse internal cross section. The electrical circuit contained a three-phase battery of capacitors needed for self-excitation. The test circuit make it possible to investigate the generator in the parallel operating mode (connected parallel with the external mains), and in the autonomous

self-oscillating mode. Equations are derived to determine the losses in the generator, and the results of measuring the separate components of these losses are examined. Also described are measurements of the magnetic field, and test data on self-excitation with power output which were obtained repeatedly for different values of capacitances, load, and temperature of the liquid potassium.

M.G.J.

N69-14070*# Aztec School of Languages, Inc., Acton, Mass.
Research Translation Div.

ELECTRICAL FIELD IN AN MGD-CHANNEL OF A RECTANGULAR SECTION WITH SEMITERMINAL ELECTRODES [ELEKTRICHESKOYE POLE V MGD-KANALE PRYAMOUGOL'NOGO SECHENIYA S POLUBESKONECH-NYMI ELEKTRODAMI]

M. M. Ignatenko Washington NASA Dec. 1968 8 p refs Transl. into ENGLISH from Magnitnaya Gidrodinamika, v. 4, no. 1, 1968 p 80-84

(Contract NASw-1692)

(NASA-TT-F-12010) Avail: CFSTI CSCL 20I

The electrical field is found in a magnetohydrodynamic channel of a rectangular section, two walls of which are semiterminal electrodes, and the other two of which are perpendicular to the direction of the external magnetic field and are insulators. The conducting fluid is assumed to be viscous and incompressible. The solution to the problem is obtained by the Wiener-Hopf method.

Author

N69-14760*# McDonnell-Douglas Co., Huntington Beach, Calif.
Western Div.

PARAMETRIC STUDY OF SPACE POWER SYSTEMS. VOLUME 2: TECHNICAL REPORT Final Report

A. D. Tonelli Nov. 1968 302 p refs

(Contract NAS2-4482)

(NASA-CR-73280; DAC-62304-Vol-2) Avail: CFSTI CSCL 22B

Presented are the results of the study effort on the Parametric Study of Space Power Systems. Included in the report is a description of the rationale used to select the power systems for investigation, a description of the guidelines and constraints used in the study, a description of the methodology used in the analysis of the power systems, and a review of complete power systems characteristics and sensitivity analysis. Also presented is a description of the H-521 computer program developed in the study, and a summary of power system technology readiness.

Author

N69-15430# Academy of Sciences (USSR), Moscow.
Hg AND Cs AS WORKING MEDIA FOR STUDIES OF CERTAIN PROPERTIES OF MHD GENERATORS WORKING IN A RANKINE CYCLE

Ya. A. Kereev, V. T. Karpukhin, and A. V. Nedospasov 1967 13 p refs Presented at the Symp. on Magnetohydrodyn. Elec. Power Generation, Warsaw, 24-30 Jul. 1968

(SM-107/130; CONF-680704 3) Avail: CFSTI

The results of the experimental and theoretical investigations aimed at the characteristics of the Hg-Cs plasma in crossed electrical and magnetical fields are described. Calculations are shown for MHD generators with the real (turbulent) conductivity in nonequilibrium plasma, and estimations of achievable efficiency and the degree of efficiency of the plant working with these media are made.

Author (NSA)

N69-16485*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RESEARCH AND ADVANCED CONCEPTS

In its Supporting Res. and Advanced Develop. 31 Oct. 1968 p 120-132 refs

Avail: CFSTI CSCL 21H

Hollow cathode operation in the SE-20C mercury ion thruster continued, with emphasis placed on tests using an adjustable cathode pole piece and baffle assembly. The results indicate that introducing all or a large fraction of the propellant through the cathode may limit utilization and increase discharge losses. Since thruster efficiency depends directly on the characteristics of the discharge plasma a study, using the Langmuir probe, was made to evaluate the efficiency improvements, and the influence of the operating parameters. Figures depict the preliminary results. Investigations continued on the use of liquid-metal magnetohydrodynamic power conversion as a power source for nuclear-electric propulsion. Generator test data are given. Further investigations were conducted on flow visualization as related to the effects of a transverse gas velocity on a glow discharge; the potential distribution within the electrical discharge region was obtained by a probe. It was found that severe distortions of the potential distribution and current distribution, caused by a transverse flow field, introduce significant complexity into theoretical approaches for computing heat transfer to the electrodes. M.G.J.

N69-18068 *# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
POWER SYSTEMS RESEARCH AT MSFC

Richard Acker, Richard J. Boehme, William L. Crabtree, Walter H. Goodhue, Charles B. Graff et al. *In its Res. Achievements Rev.*, Vol. 2 1968 68 p
 Avail: CFSTI CSCL 10

A scale model was developed of a 6 V, 70 A-hr battery containing cells with the exact electrode configuration and size that will be required for the 28 V, 400 A-hr vehicle power system. A capillary matrix close-loop cell system was developed for space applications. Basic development work resulted in the fabrication of a design verification test fuel cell system for qualification on space missions. Fuel cell technology research was conducted in electrodes and electrolytes at the basic research level and in cooling systems and environmental testing at the systems' analysis level. A systems analysis and description are presented on the SNAP 29 power system. A method for predicting the amount of power available from a solar array in circular orbit and under gravity gradient stabilization is presented. A brief presentation is made of the metal arc illuminator for solar array testing. An electrical power conversion system designed for a manned earth orbital vehicle is described. A comparison is made of several typical motors used to power auxiliary equipment up to 1.5 kW; the advantages and disadvantages of each type motor are mentioned. B.P.

N69-18439 # Advisory Group for Aerospace Research and Development, Paris (France).

SELECTED TOPICS IN ELECTROFLUID DYNAMIC ENERGY CONVERSION

Maurice O. Lawson ed., and Frank Wattendorf, ed. Dec. 1968 260 p refs Presented at Electrofluid Dyn. Workshop Conf., Wright-Patterson AFB, Ohio, 23-25 May 1966. Supported in part by ARL
 (AGARDOGRAPH-122) Avail: CFSTI

CONTENTS:

1. THE ROLE OF ELECTROFLUID DYNAMICS IN THE FIELD OF DIRECT ENERGY CONVERSION H. V. Ohain (Aerospace Res. Labs.) p 5-13
2. ELECTROFLUID DYNAMIC ENERGY CONVERSION PROCESSES CHARACTERISTICS AND RESEARCH AREAS M. O. Lawson (Aerospace Res. Labs.) p 14-33 refs
3. EFFECTS ON ELECTRODE GEOMETRY SIMILARITY AND SCALING LAWS IN EFD ENERGY CONVERSION PROCESSES. PART 1: FUNDAMENTAL CONSIDERATIONS J. A. Decaire

(Aerospace Res. Labs.) p 34-63 refs

4. EFFECTS OF ELECTRODE GEOMETRY SIMILARITY AND SCALING LAWS IN EFD ENERGY CONVERSION PROCESSES. PART 2: EXPERIMENTAL RESULTS J. R. Wifall (Aerospace Res. Labs.) p 64-95

5. WORKING MEDIA FOR ELECTROFLUID DYNAMIC GENERATORS M. Hawes (Aerospace Res. Labs.) p 96-123 refs

6. SOME ANALYTICAL TREATMENTS OF EFD PROCESSES J. E. Minardi (Aerospace Res. Labs.) p 124-179 refs

7. SOME REMARKS ON EFD ENERGY CONVERSION J.-P. Contzen (Von Kaman Inst. for Fluid Dyn.) p 180-186 refs

8. DESIGN AND CONSTRUCTION OF A 3-MW MAGNETOGASDYNAMIC POWER GENERATION FACILITY AT THE UNIVERSITY TORONTO INSTITUTE OF AEROSPACE STUDIES S. J. Townsend (Toronto Univ.) p 188-202

9. PLASMA RESEARCH IN DENMARK K. Refslund (Tech. Univ.) p 203-204

10. COMMENTS ON ELECTROFLUID DYNAMICS AND RELATED RESEARCH IN FRANCE J. Fabri (Office Natl. d'Etudes et de Recherches Aérospatiales) p 207-209

11. THE ELECTROFLUID DYNAMIC ENERGY CONVERTER WITH SPACECHARGE NEUTRALIZATION E. Knoernschild and P. A. Schoeck (Deutsche Versuch. für Luft- und Raumfahrt) p 210-232

12. COMMENTS ON ELECTROFLUID DYNAMICS AND RELATED RESEARCHES IN ITALY L. G. Napolitano (Naples Univ.) p 234-243 refs

13. INTEREST AND PROGRESS IN ELECTROFLUID DYNAMICS AND RELATED RESEARCHES IN ENGLAND R. G. Voysey (British Embassy) p 244-262 refs

N69-18440 # Aerospace Research Labs., Wright-Patterson AFB, Ohio.

THE ROLE OF ELECTROFLUID DYNAMICS IN THE FIELD OF DIRECT ENERGY CONVERSION

Hans von Ohain *In AGARD Selected topics in Electrofluid Dyn. Energy Conversion Dec. 1968* p 5-13
 Avail: CFSTI

Although relatively unexplored among the many direct energy conversion processes, electrofluid dynamics (EFD) promises performance characteristics complementary to other processes in the overall energy conversion spectrum. The high potential, low current density electrical power of EFD devices has several natural applications. Moreover, virtually unlimited application possibilities will open up with the development of compact, inexpensive power conditioning apparatus. Author

N69-18441 # Aerospace Research Labs., Wright-Patterson AFB, Ohio.

ELECTROFLUID DYNAMIC ENERGY CONVERSION PROCESSES CHARACTERISTICS AND RESEARCH AREAS

Maurice O. Lawson *In AGARD Selected topics in Electrofluid Dyn. Energy Conversion Dec. 1968* p 14-33 refs

Avail: CFSTI

The major characteristics of electrofluid dynamic generators are quite different from other direct energy conversion generators so that an important class of generators complementary to other generators is promised. Theoretical analyses have indicated the basic relationships between the various aerodynamic and electrical parameters. First order types of analyses have been made for different types of geometries, including the axisymmetric and two

05 ENERGY CONVERSION

dimensional. More exact analyses remain to be done and experimental research efforts are in a rather early state. The experimental data obtained so far established reasonably good faith in the theoretically predicted trends and relationships. Much of this experimental effort has been concentrated in unipolar charge production, as the achievement of proper current levels is a prerequisite for a favorably operating generator. Other major research areas are electrode and channel geometries, high voltage and high voltage gradient insulation, properties of working fluids and suitable overall cycles for converting heat efficiently into electrical energy.

Author

N69-18442# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

EFFECTS ON ELECTRODE GEOMETRY SIMILARITY AND SCALING LAWS IN EFD ENERGY CONVERSION PROCESSES. PART 1: FUNDAMENTAL CONSIDERATIONS

John A. Decaire / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 34-63 refs

Avail: CFSTI

Attractive performance characteristics are possible with viscous EFD processes which employ electrode and channel configurations corresponding to small aerodynamic drag losses, and which utilize pressurized gases of low molecular weight and high dielectric strength containing unipolar charged particles. Basically however, EFD processes are low pressure ratio processes inconsistent with a high overall conversion efficiency from heat into electricity. To overcome this incompatibility, ARL is exploring a special two-loop, two-fluid cycle. Successful operation of this concept requires the ability to seed the working medium with charge densities which are the highest possible consistent with fundamental channel limitations. A corona discharge is being investigated for charge seeding.

Author

N69-18444# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

WORKING MEDIA FOR ELECTROFLUID DYNAMIC GENERATORS

Michael Hawes / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 96-123 refs

Avail: CFSTI

Desirable characteristics of electrofluid dynamic working media with regard to power generation are reviewed. The dimensionless numbers of interest for power density and stage efficiency are cited. Since special mixtures of gases can provide better values of these dimensionless numbers than a single gas or vapor, an experimental program to determine dielectric strength of gas mixtures was conducted. Investigation results are given and comparisons with high pressure air as the working medium are made. Author

N69-18445# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

SOME ANALYTICAL TREATMENTS OF EFD PROCESSES

John E. Minardi / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 124-179 refs

Avail: CFSTI

An approximate, analytic solution to the charge cloud growth in an axisymmetric electrofluid dynamic (EFD) generator is presented. With these formulas, a computer program is used to calculate the efficiency and power density over a wide range of parameters. A computer program for plane parallel electrodes that includes the effects of charge spreading due to the electric field is also developed. Results show that electric field effects on the motion of charged colloids are negligible. Therefore, a numerical

approach is developed to study complex electrode geometries of EFD generators considering the charge distribution to be known from fluid flow considerations.

Author

N69-18446# Von Kaman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).

SOME REMARKS ON EFD ENERGY CONVERSION

Jean-Pierre Contzen / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 180-186 refs

Avail: CFSTI

Some of the work carried out in Belgium in the field of fluid dynamics associated with electric or magnetic effects is briefly reviewed. The paper gives also some suggestions on possible applications of the EFD energy conversion process.

Author

N69-18447*# Toronto Univ. (Ontario). Inst. for Aerospace Studies. **DESIGN AND CONSTRUCTION OF A 3-MW MAGNETOGASDYNAMIC POWER GENERATION FACILITY AT THE UNIVERSITY OF TORONTO INSTITUTE OF AEROSPACE STUDIES**

Stanley J. Townsend / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 188-202 Supported in part by NASA, Defence Res. Board, and Ontario Dept. of Univ. Affairs

Avail: CFSTI CSCL 201

The design features of a 3-MW, blow-down plasma facility are described. The primary aim has been to construct a facility having a large interaction channel to emphasize volume rather than surface effects. Independent control of flow velocity, static pressure, static gas temperature and magnetic field in the channel can be achieved over a wide range of operating conditions. Static pressures are achievable from a few Torr to over seven atmospheres, stagnation temperatures up to 2200-2500°K and magnetic fields up to 1.7 Tesla. Provision has been made for the additional radial or vortex-flow channels on a separate outlet of the main heater at a later date. Instrumentation of a constant-area channel, 5 cm × 10 cm × 120 cm, to measure the voltage and current characteristics of up to fifty electrode pairs has been completed. First runs are expected in the summer of 1968.

Author

N69-18448# Technical Univ., Copenhagen (Denmark). Fluid Mechanics Dept.

PLASMA RESEARCH IN DENMARK

K Refslund / In AGARD Selected Topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 203-204

Avail: CFSTI

Advanced plasma research in Denmark concentrated on the following three pieces of equipment: (1) a Q-machine for studying wave instabilities in plasmas. The parameters are measured in by Langmuir probes; (2) the a spark-shorting capacitor bank over two, parallel slabs of brass placed in vacuum for plasma production. Observations are made by smear camera and by mass spectrometer on the following: N₂, Ne, Ar, and He; and (3) a homopolar machine with a fast acting gas valve for studying rotating high energy plasmas.

G.G.

N69-18450# Deutsche Versuchsanstalt für Luft- und Raumfahrt, Stuttgart (West Germany). Institut fuer Energiewandlung und Elektrische Antriebe.

THE ELECTROFLUID DYNAMIC ENERGY CONVERTER WITH SPACECHARGE NEUTRALIZATION

Eugen Knoernschild and Peter A. Schoeck *In* AGARD Selected topics in Electrofluid Dyn. Energy Conversion Dec. 1968 p 210-232
 Avail: CFSTI

This paper is concerned with a device which would eliminate the biggest disadvantage of the electrofluid dynamic (EFD) converter, namely its operation at very high voltage. The question, in which the first-named author was interested about ten years ago, was whether one could get rid of the space charge and design a converter which has its space charge neutralized, and therefore would operate at any voltage desired. In recent years this idea was taken up in the Hall accelerator which can be considered a space charge neutralized ion engine. After a short introduction to the various types of EFD energy converters, the basic difference between the space charge limited and the space charge neutralized operation is pointed out. The importance of a magnetic field on the mechanism of space charge neutralization is described. The equation of flow and of the forces which act in a space charge neutralized converter are derived. Test results which prove that space charge neutralization is possible, are presented. Author

N69-20548# National Academy of Sciences—National Research Council, Washington, D. C. Committee on Undersea Warfare.

ENERGY SYSTEMS OF EXTENDED ENDURANCE IN 1-100 KILOWATT RANGE FOR UNDERSEA APPLICATIONS

Sep. 1968 133 p refs

(Contract Nonr-2300(08))

(AD-681068; NRC-CUW-0348; PUBL-1702) Avail: CFSTI CSDL 10/2

A report is given on the state of technology of energy systems that may have undersea applications by a select panel. The pertinent features of the most promising among electrochemical and nuclear sources, as well as dynamic conversion and cable transmission systems are discussed in some detail. Related technologies such as, hydrogen-oxygen supply systems and heat transfer technology are also summarized. The nature, magnitude and priority of effort required for the Navy to have available several alternatives for meeting its future needs is also detailed.

Author (TAB)

N69-20852* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

COMPARISON OF BRAYTON AND RANKINE CYCLE MAGNETOGASDYNAMIC SPACE-POWER GENERATION SYSTEMS

Lester D. Nichols Washington Mar. 1969 59 p refs

(NASA-TN-D-5085) Avail: CFSTI CSDL 10B

Idealized Brayton- and Rankine-MHD cycles are considered for use in space. The Brayton-MHD cycle uses neon as the working fluid; the Rankine-MHD uses lithium. Both are seeded with cesium. The systems are restricted to a specified generator length and specific radiator area. It is shown that generally an entrance Mach number of 1.0 provides maximum power output; for the same value of Hall parameter the Rankine-MHD system may be used at a lower temperature than the Brayton-MHD; but at the same maximum temperature the Brayton-MHD generates more power than the Rankine-MHD. Subsonic entrance Mach number is recommended for Brayton-MHD, and supersonic for Rankine-MHD.

Author

N69-20875* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ELECTROTHERMAL INSTABILITIES IN THE ENTRANCE REGION OF AN MHD GENERATOR

J. Marlin Smith Washington Mar. 1969 23 p refs
 (NASA-TM-X-1761) Avail: CFSTI CSDL 20I

In the entrance region of a nonequilibrium MHD generator one finds an abrupt rise in electron temperature followed by a four- or five-decade increase in electron density. We consider the stability of this region of abrupt electron density rise. A solution is found in the limit that the ambipolar diffusion field is small compared to the transverse applied electric field. The solution is found to be stable in the limit of zero magnetic field but to be unstable in the presence of a magnetic field. Author

N69-21275# Avco-Everett Research Lab., Everett, Mass.

INSTABILITY OF HALL MHD GENERATORS TO MAGNETO-ACOUSTIC WAVES

Frank J. Fishman Feb. 1969 42 p refs

(RR-323) Avail: Issuing Activity

It is known that magnetoacoustic waves propagating anti-parallel to a steady electric current in a dense, weakly ionized gas may exhibit substantial growth. The stability of a Hall MHD generator with supersonic flow to disturbances of this type is assessed. A proper boundary value problem is solved, with full consideration of the load circuit, which may serve as a feedback path for wave energy. It is shown that this feedback may lead to instabilities even under conditions such that the wave growth (as evaluated by earlier investigations) is slow. Disturbances with a period comparable to the flow time (channel length/fluid velocity) are the principal contributors to the instability; the spatial variation of these disturbances are far from sinusoidal. The control of machine instabilities by electrical filters in the external (load) circuit is described. Author

N69-21373# Aktiebolaget Atomenergi, Stockholm (Sweden).

NONLINEAR DYNAMIC MODEL OF POWER PLANTS WITH SINGLE-PHASE COOLANT REACTORS

Heinz Vollmer Dec. 1968 34 p refs

(AE-341) Avail: CFSTI

The traditional way of developing dynamic models for a specific nuclear power plant and for specific purpose seems rather uneconomical, as much of the information often cannot be utilized if the plant design or the required accuracy of the calculation is desired to be changed. It is therefore suggested that the model development may be made more systematic, general and flexible by: applying the 'box of bricks' system, where the main components of a nuclear power plant are treated separately and combined afterwards according to a given flow scheme, a dynamic determination of the components which is as general as possible without taking into account those details which have a minor influence on the overall dynamics; providing approximations of the more rigorous solution sufficient to meet the user's requirements

N69-21376* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

ANALYSIS OF A MULTISTAGE LIQUID METAL MAGNETOHYDRODYNAMIC POWER CONVERSION CYCLE

L. G. Hays 1 Apr. 1969 12 p refs

(Contract NAS7-100)

(NASA-CR-100500; JPL-TR-32-1371) Copyright. Avail: CFSTI CSDL 10B

A liquid metal magnetohydrodynamic (MHD) power system with power extraction at several stages in the expansion process is discussed and analyzed. Cycle efficiency is shown to improve from the 6% range for a single stage 1800°F system to the 10% range for multistage 1800°F systems. Cycle efficiency at 2000°F is slightly lower but a smaller radiator area is attainable than at 1800°F. The advantages of lower liquid metal velocities and MHD generator redundancy are also possible in a multistage system.

Author

05 ENERGY CONVERSION

N69-21929* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MAGNETOHYDRODYNAMIC INDUCTION MACHINE
David G. Elliott, inventor (to NASA) Issued 14 Jan. 1969 (Filed 6 Jul. 1966) 10 p. Cl. 310-11
(NASA-Case-XNP-07481; US-Patent-3,422,291;
US-Patent-Appl-SN-563650) Avail: US Patent Office

An MHD induction machine was designed in which the MHD induction phenomenon is more closely analogous to that taking place in a conventional rotating induction machine. This was done in order to increase the efficiency of the MHD induction machine to the level attained with rotating machines. By providing end poles which produce a compensating magnetic field, the flux through the conducting fluid in the MHD induction machine is constant at zero slip, minimizing the induction of heating currents therein. The net magnetic field which the fluid traverses is analogous

is assumed. (4) Auxiliary plasma heating apparatus is required for ignition. (5) they must operate at a particular value of the product of ion density and confinement time. The differences are: (1) The induced plasma current in a Tokamak supplants the use of helical windings in the stellarator. (2) Cyclic operation is necessary for Tokamaks. (3) Tokamaks may require a lower β than stellarators. Difference number one could be an important advantage for Tokamaks, while difference number two may be only a small disadvantage since the duty cycle should be high. Difference three may be important. Author (NSA)

N69-22640# California Univ., Livermore. Lawrence Radiation Lab.

LARGE SUPERCONDUCTING BASEBALL MAGNET, PART 1

C. D. Henning, R. L. Nelson, M. O. Calderon, A. K. Chargin, and A. R. Harvey 21 Mar. 1968 21 p. refs. Submitted for publication (Contract W-7405-eng-48)
(UCRL-71010; Conf-680813-3) Avail: CFSTI

A 1.2-m-diam superconducting magnet is under construction as part of the Alice experiment in controlled thermonuclear fusion research. Shaped like the seam of a baseball, the magnet will produce a cusped magnetic field, close to 20 kG in the center, and up to 75 kG at the conductor. The superconductor, a 1/4-in.-square composite of niobium-titanium with copper, will carry 2400 amperes during partially stable operation. Previously, large magnets have been conservatively designed for total nucleate-cooling stability. However, in this instance, space limitations have demanded a more severe stability requirement. Other novel features of this magnet include the ability to vary the shape of the magnetic field and the use of a new high-manganese stainless steel for the force restraining structure. Author (NSA)

N69-23173# California Univ., Livermore. Lawrence Radiation Lab. Radiation Lab.

RANKINE CYCLE SYSTEMS STUDIES FOR NUCLEAR SPACE POWER

J. H. Pitts and M. H. L. Jester 31 May 1968 24 p. refs. Submitted for publication. Supported by AEC
(UCRL-70863; Conf-680802-6) Avail: CFSTI

Two different types of Rankine cycle systems studies are described which can be used to advantage in conjunction with each other. A simple, flexible conceptual design representation gives consistent, general trend results and yet requires minimum expenditure of effort to incorporate changes. After initial design phases are complete, a detailed system representation that includes extensive neutronic and shielding information is used to give final design characteristics of the complete system and components of interest. Some recommendations for future effort are made. Author (NSA)

N69-23954# Princeton Univ., N. J. Plasma Physics Lab.
A CURSORY LOOK AT TOKAMAK FUSION REACTORS
R. G. Mills Dec. 1968 15 p. refs
(Contract AT(30-1)-1238)
(MATT-659) Avail: CFSTI

Hypothetical fusion reactors of the Tokamak and stellarator types are extremely similar. The similarities include the following five points: (1) A toroidal vacuum chamber is required, of low aspect ratio. (2) A divertor is needed. (3) A cold fuel injection system

N69-23996# Bell Helicopter Co., Fort Worth, Tex.
THE EFFECT OF ADVANCED PROPULSION ON FUTURE ROTARY WING TYPE AIRCRAFT

L. M. Graham, A. W. Shultz, and H. C. Smyth In AGARD Helicopter Propulsion Systems Jun. 1968 16 p. ref

Avail: CFSTI

Three types of rotary-wing aircraft were studied: a pure helicopter, a slowed-rotor compound helicopter, and a tilting-propeller composite aircraft. Using the gas generator turbine-inlet temperature as an index, the general trends of improvement in specific fuel consumption, specific weight, specific fuel consumption at part power, and available power at high ambient temperatures were determined. These trends were then used to forecast the characteristics of rotary wing aircraft designed to hover at 4000-foot pressure altitude, at 95°F, with a payload and crew of 4000 pounds, and having design ranges of 200 and 400 nautical miles. It was concluded that for the same payload, performance, and mission, the aircraft using advanced technology engines will be much smaller and lighter than those using current generation engines. The fuel required and the installed power necessary to perform a given mission will be reduced with the advanced technology engines. These improvements will substantially increase the productivity and the cost effectiveness of the aircraft. The degree of improvement will vary almost directly with the design range. Author

N69-23998# Pisa Univ. (Italy).

SIMPLE SOLUTIONS OF THE HELICOPTER PROPULSION SYSTEM MADE POSSIBLE USING CLOSED CYCLE FOR THE WORKING FLUID

Dino Dini In AGARD Helicopter Propulsion Systems Jun. 1968 34 p. refs

Avail: CFSTI

Several configurations for small helicopters operating in the 50 to 200 HP range of useful power are analyzed showing suitable rotor-engine integration using a light-weight closed cycle steam engine. It is demonstrated that a multiple expansion engine can turn directly without gearing the utilization shaft, thus reducing the total working fluid weight to an acceptable level. Real cycles, mechanical designs, with convenient economic, volume and weight characteristics, are discussed. The possible use of simple closed cycle engines, operating at different speeds and altitudes, with fluidic controls is also treated. Particular advantages are emphasized as a first step toward future applications at such time when compact heat sources, such as the Velox boiler, radioisotopes and nuclear reactors, become available for this purpose. A.C.R.

N69-24985# Commissariat a l'Energie Atomique, Saclay (France). Centre d'Etudes Nucleaires.

ALL-METAL THERMIONIC NUCLEAR MODULE [MODULE THERMOIONIQUE NUCLEAIRE TOUT-METAL]

B. Devin, J. P. Durand, and P. Ragot [1968] 8 p. In FRENCH Presented at the Intern. Conf. on Thermionic Elec. Power Generation, Stresa, Italy, 27-31 May 1968

(CEA-CONF-1041; CONF-680508-9) Avail: AEC Depository Libraries

This all-metal thermionic module is distinguished from a normal cylindrical diode by the collector ensemble. The Mo collector is covered by a layer of alumina, placed inside a tube of Ti-Al and the two are compacted together by hot isostatic compression. The base of the collector structure has a cavity for the integrated cesium reservoir. The reservoir is charged separately with cesium-impregnated graphite. The optimum dimensions of the module were calculated. Experimental results on the performance of the all-metal thermionic module are tabulated. The lower yield in comparison with conventional converters is compensated by the simplicity of fabrication from commercial components, the sturdiness, and the cost. NSA

N69-25396* Pennsylvania Univ., Philadelphia. Electrochemistry Lab.

STUDIES IN FUNDAMENTAL CHEMISTRY OF FUEL CELL REACTIONS Semiannual Progress Report, 1 Jan.-30 Jun. 1968

John O'M. Bockris Jun. 1968 44 p refs

(Grant NGR-39-010-002)

(NASA-CR-100892; SAPR-12) Avail: CFSTI CSCL 07D

Ellipsometer data on phase changes and changes in the amplitude ratio of polarized light reflected from an adsorbed anion layer on a mercury surface were analyzed and compared with data obtained by electrocapillary methods. A good agreement was found between both methods. The development of alkali metal-air batteries progressed with the design of computer programs for calculating the three dimensional path of minimum potential energy and the potential energy profile along this path for ions moving through the crystal lattice. The dendritic deposition of zinc from alkaline solution was studied by measuring the changes in double layer capacitance as zinc deposition proceeded both above and below the critical initiation overpotential. A qualitative model of dendrite initiation based on progressive surface roughening was formed. G.G.

N69-25803* Institute for Defense Analyses, Arlington, Va. Science and Technology Div.

PERFORMANCE, ANALYSIS SELECTION OF BALLOON ELECTRICAL POWER SYSTEMS

Robert C. Hamilton Dec. 1968 82 p refs

(Contract DAHCl5-67-C-0011)

(AD-682898; P-455) Avail: CFSTI CSCL 10/2

The weights of selected 200- and 4000-watt power systems for tethered and free balloons are presented as a function of operating time at altitudes of 10,000, 20,000, 30,000, and 50,000 ft. For tethered balloons, the 8-kv cable system weighs less than any other system that could be made available within 18 months. The microwave rectenna systems, when developed, would weigh appreciably less than the high-voltage cable system at 200 watts. The margin of performance of the 4-kw microwave rectenna system over the high-voltage cable system should be significant, particularly at 30,000- and 50,000-ft altitudes. For free balloons, which cannot use the preferred tethered cable or microwave rectenna systems, the minimum weight power system is the hydrogen-oxygen fuel cell for operating times of 50 hours or less. The solar-cell/fuel-cell combination is superior for operating times of 50 hours or more at the 4-kw level and 120 hours or more at the 200-watt level. Author (TAB)

N69-26189* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A COMPARISON OF MAGNETIC SYSTEMS FOR PRODUCING STRONG LARGE-VOLUME FIELDS

Ye. L. Zaremba et al 31 Oct. 1968 24 p refs Transl. into ENGLISH from Magnitn. Gidrodinam., Akad. Nauk Latv. SSR (Riga), no. 4, 1967 p 124-134

(AD-683989; FTD-MT-24-375-68) Avail: CFSTI CSCL 10/2

Four types of magnetic systems are analyzed and compared with regard to their suitability for use in large-scale MHD power generators. The four types discussed are: (1) an ironless coaxial magnetic system with a tangential field, (2) an ironless elliptical-type system with a winding in the form of two intersecting ellipses or circles, (3) an O-shaped system with a magnetic circuit, and (4) a diamond-shaped system with a magnetic circuit. The tabular data show the advantages of the elliptical system over the others for the whole range of the excitation energy, which is a function of the relative thickness of the current layer. The diamond-shaped system is preferred, however, if losses can be reduced by reducing the resistivity of the winding material. In the magnetic systems analyzed, excitation losses amount to about 10% of the generated energy, provided the MHD generator is sufficiently large. TAB

N69-26241* Joint Publications Research Service, Washington, D.C.

SOVIET STUDIES ON MAGNETOHYDRODYNAMIC GENERATORS

A. T. Rakhimov et al 14 May 1969 41 p refs Transl. of the book "Electricity from MHD, Vol. 1" 1966 p 333-341; p 465-472

(JPRS-48041) Avail: CFSTI

CONTENTS:

1. MAGNETIC HYDRODYNAMICS OF FLOW IN MHD DUCTS A. T. Rakhimov et al p 1-11 refs

2. CALCULATION OF THE BOUNDARY LAYER AT THE ELECTRODE OF A PLANE MHD GENERATOR A. Ye. Yakubenko p 12-21 refs

N69-26242* Joint Publications Research Service, Washington, D.C.

MAGNETIC HYDRODYNAMICS OF FLOW IN MHD DUCTS

A. T. Rakhimov et al In its Soviet Studies on Magnetohydrodynamic Generators 14 May 1969 p 1-11 refs

Avail: CFSTI

Problems are discussed of the magnetic hydrodynamics of flows with hot electrons in MHD ducts at low magnetic Reynolds numbers. In connection with boundary layer theory, conditions of the occurrence of detachment and the jump in density associated with it are discussed for a supersonic flow. Methods of preventing detachment are discussed; in particular the required degree of exhaustion of the plasma from the boundary layer is calculated. Attention is also given to wave resistance to a supersonic flow which arises from the uneven distribution of the current on the electrode wall of the duct. In connection with the theory of shock waves in a plasma with hot electrons, the structure of these waves in relation to ionization is considered, together with their stability. Problems related to the appearance of parasitic closed currents, with a strong reduction in conductivity of the plasma beyond the shock-wave front and a change in the mode to accelerating, are also dealt with. Author

N69-26243* Joint Publications Research Service, Washington, D.C.

CALCULATION OF THE BOUNDARY LAYER AT THE ELECTRODE OF A PLANE MHD GENERATOR

A. Ye. Yakubenko In its Soviet Studies on Magnetohydrodynamic Generators 14 May 1969 p 12-21 refs

Avail: CFSTI

05 ENERGY CONVERSION

The problem of the flow of an electrically conducting gas through crossed electric and magnetic fields in a plane MHD generator with ideally conducting walls is considered. The conditions are set forth for independently solving problems relating to the boundary layer at the electrodes and to the center of the flow. The conditions at the center of the flow are calculated numerically by means of one dimensional theory for subsonic and supersonic velocities. The dependences of the flow characteristics on the load parameter are found. The nonautomodel boundary layer equations are solved numerically for small magnetic Reynolds numbers at one of the MHD generator electrodes. The dependence of the resistive force and the Nusselt number on the load parameter and the coordinate along the electrode is found. It is shown that the resistive force and the heat flux described by the Nusselt number increase considerably as compared to the case of nonconducting gas.

Author

N69-26520# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SECOND GENERATION GAS TURBINE ENGINES. DISCUSSION OF TURBOFAN ENGINES

Hsiao Ling 23 Aug. 1968 11 p refs Transl. of Hang K'ung Chih Shih (Mainland China), v. 1, no. 10, 1964 p 16-18

(AD-683118; FTD-HT-23-858-67) Avail: CFSTI CSCS 21/5

Turbojet aircraft fly at a speed exceeding 2000 km/hr and have a higher rate of fuel consumption. Mig-15 and Tu-104 aircraft powered by turbojet engines have a fuel consumption rate of 0.8-1.0 kg per 1-kg thrust per hr. Turboprop engines were developed for the purpose of fuel economy. Turboprop engines have similar construction and operate on the same principle as a turbojet engine. The only difference in a turboprop engine is the addition of a propeller outside the compressor. Turboprop engines are built for long-range civil transport airplanes flying at a speed of 800-900 km/hr. Turboprop engines can also be used in military aircraft having a flying speed of 4-4.5 mach if an afterburner is added. Tests showed that the fuel consumption of turboprop engines is reduced 18-20% under the same internal flow condition. Takeoff thrust is also increased 30-40% and engine noise is reduced 10-15 db. Turboprop engines, however, are more complicated in construction, heavier, and larger in diameter (30-40%) than turbojet engines. More than 40 types of turboprop engines have been developed recently. A small turboprop engine capable of producing a thrust of only 300 kg is in process of development. A large turboprop engine having a thrust of 9000-10000 kg and a fuel consumption rate of 0.51-0.54 kg per 1-kg thrust per hr has been developed. Middle-range Tu-124 passenger airplanes powered by turboprop engines have a fuel consumption rate 15-25% lower than Tu-104 airplanes

Author (TAB)

N69-26532# Von Karman Inst. for Fluid Dynamics, Rhode Saint-Genese (Belgium).

AERODYNAMIC PROBLEMS IN COOLED TURBINE BLADING DESIGN FOR SMALL GAS TURBINE

J. Chauvin, K. Papailiou, and L. Burrows (Army Aviation Mater. Labs.) // AGARD Advan. Components for Turbojet Eng., Pt. 2 Sep. 1968 22 p refs

Avail: CFSTI

The next generation of small gas turbines (in the 500 to 1000 shp range) will have to use turbine inlet temperatures of the order of 1200°C, if specific fuel consumption and specific power better than those of piston engines must be reached. Such temperatures can be realized only if cooling of the nozzle and blades of the compressor turbine is used. Air and liquid cooling are being considered. Strength and space requirement lead to the use of thick blades, especially at the trailing edge, and having a minimum chord length of several centimeters. The mass flow to handle leads to small passages height and therefore to aspect ratios of the order

of 0.4. High losses are generated due to blade profile, trailing edge thickness and above all, secondary losses. A review is made of the research in the field of blade optimization and in the analysis and reduction of secondary flows and losses, (wall shaping etc.).

Author

N69-26620# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELEMENTS OF THE GENERAL THEORY OF TRANSIENT WORK PROCESSES OF LIQUID-METAL MHD CONDUCTION TYPE GENERATORS

A. N. Patrashev, A. G. Ryabinin, and A. I. Khozhainov 12 Jul. 1968 45 p refs Transl. into ENGLISH OF Akad. Nauk SSSR, Inst. Vysokikh Temperatur (USSR) 33 p

(AD-680712; FTD-HT-23-586-68) Avail: CFSTI CSCS 10/2

The theoretical research is applicable to a laminar flow regime of the liquid metal in the channel of an MHD generator. These flow conditions can be the working conditions. In addition, at high speeds of the liquid metal the flow conditions can be turbulent. An analysis of the attained solutions has made it possible to establish that during laminar flow conditions of a liquid metal, for a description of the change with respect to time of the integral parameters of the flow, one can successfully make use of a quasi-stationary approximation taking into account frictional forces. Author (TAB)

N69-27071# Stanford Univ., California. Plasma Gasdynamics Lab.

ELECTRODE TEMPERATURE EFFECT ON MHD GENERATOR PERFORMANCE

R. H. Eustis, M. Mitchner, and C. H. Kruger Wright-Patterson AFB, Ohio AFAPL Jan. 1969 63 p refs

(Contract F33615-67-C-1127)

(AD-683793; SU-IPR-274; AFAPL-TR-68-141) Avail: CFSTI CSCS 10/2

Five segmented electrode pairs capable of controlled temperatures between 700K and 1700K were mounted at the downstream end of the MHD channel. The temperature of the electrode wall upstream of the electrode was controlled at two values, 750K and 2400K. By means of probes mounted in the sidewall, it was possible to measure the voltage drop at the electrodes due to the combined boundary layer and surface-sheath effects. Results showed that hot electrodes performed considerably better than cold electrodes and that anode voltage losses were largely due to boundary-layer losses while cathode losses were caused by boundary-layer and surface-sheath effects. Computer calculations were made to show the effect of electrode size for three types of gas conductivity profiles corresponding to no thermal boundary-layer and cold and hot boundary-layers. Spectroscopic measurements of the boundary-layer temperature showed that the profile could be represented by a power-law enthalpy profile with the exponent equal to 1/8. An experiment was made to determine if finite recombination rates had a significant effect in combustion MHD generators. Techniques were investigated for measuring electron temperature and number density in combustion gas plasmas.

Author (TAB)

N69-27397# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE ENIN-2 EXPERIMENTAL OPEN-CYCLE MHD GENERATOR RIG [EKSPERIMENTALNAYA USTANOVKA MGD-GENERATORA OTKRYTOGO TSIKLA ENIN-2 SM-107/159]

D. G. Zhimerin et al 12 Aug. 1968 14 p Transl. into ENGLISH from Russian publication

(AD-683131; FTD-MT-24-175-68) Avail: CFSTI CSCS 10/2

An experimental rig has been set up to study the processes taking place in the duct of an open-cycle MHD generator. The installation consists of a combustion chamber unit in which natural

gas is oxidized in an air atmosphere enriched in oxygen (up to pure O₂) with ionizing seeds of different types. The pressure in the duct can go up to 50 atm and the temperature to 3500K. As the combustion products pass into the duct, the nozzle system can vary the Mach number from subsonic to Mach 3. The duct has a rectangular section. Its maximum dimensions, determined by the magnet bore, are 0.2 x 0.34 x 2.5 m. The ducts are interchangeable to give the possibility of varying the area modification law relating to the section along the axis of the duct and of altering the electrode circuit or the size of the electrodes or insulation gaps, etc. The combustion chamber, nozzle and duct are made of stainless steel and are water-cooled; a coating of aluminum oxide serves as insulation. Depending on the mode of operation, the installations calculated power and electric power are in the neighborhood of 250 MW and 10 MW, respectively. TAB

N69-27494# Commissariat a l'Energie Atomique, Cadarache (France). Centre d'Etudes Nucleaires.
PEGASE REACTOR LOOPS (LES BOUCLES DU REACTEUR PEGASE)
 Nov. 1968 115 p In FRENCH
 (CEA-R-3564) Avail: AEC Depository Libraries

The first 4 years operation, experimentation and maintenance of the gas loops built especially for the nuclear fuel testing reactor Pegase are described. The reasons for the technical modifications and the way in which they were carried out are also described. Author (NSA)

N69-28597# European Nuclear Energy Agency, Paris (France).
MHD ELECTRICAL POWER GENERATION Status Report, 1969
 Apr. 1969 67 p refs
 Avail: CFSTI

The current status of MHD electrical power generators is reviewed with its application to large-scale, commercial power generation receiving primary consideration. The open cycle system in which the working fluid is a plasma formed by seeded combustion products has received most attention because of its near-term applicability to fossil fueled power plants. Model generators with electrical outputs of up to 30 MW have been operated for short times in good agreement with predicted performance, and long duration operation of the generator and other components has been demonstrated for periods of over 100 hours on a small scale. The efficiency of a full-scale, open cycle installation would initially be in the range 48% to 50% for a combined MHD-steam cycle and improvements in technology could later increase this to 60%. Closed cycle systems may be operated with either a seeded noble gas plasma or a liquid metal in the MHD generator. In the case of plasma systems, the necessary hot electron plasma has now been obtained. Liquid metal systems of improved efficiency and a prototype system for space vehicle applications are under development. Author

N69-28635# California Univ., Livermore, Lawrence Radiation Lab.
ONE-DIMENSIONAL CALCULATIONS ON A FINITE-LENGTH MHD INDUCTION CONVERTER
 Myron Heusinkveld 30 Oct. 1968 71 p refs
 (UCRL-50537) Avail: CFSTI

A linear induction converter is considered here, involving the flow of a liquid metal, through a narrow channel across which an ac magnetic field is impressed. Electrical currents are induced in the fluid, which react back on the field windings to generate electrical power. The magnetic field relations are solved in the one-dimensional approximation, in which the magnetic field and the fluid velocity are uniform across the gap. The equation for the total magnetic induction B_t is deduced from Faraday's law. The solution of this equation is found. From this solution, equations are obtained for electrical impedance of the excitation winding, hydrodynamic

power input, real and reactive electrical power output, real and reactive electrical power output, and the energy conversion efficiency. Results of numerical calculations of the problem of a uniform traveling-wave generator of finite length are presented. These results include magnetic field distribution, electrical impedance, and conversion efficiency as a function of magnetic Reynolds number, generator slip, converter length in wavelengths, and end current. NASA(Author)

N69-28781# Union Carbide Corp., Parma, Ohio. Development Dept.

HYDRAZINE-AIR FUEL CELL CONTROLS
 G. E. Evans 1968 12 p
 (AD-684339) Avail: Issuing Activity CSCL 10/2

One of the major areas researched for hydrazine-air fuel cell controls has been the testing and qualification of new parts and components, designed for better compliance with environmental and performance specifications. The principal work was to transform a power source which was functional in the sense of delivering the proper number of volts and amperes into a power source which remains functional, but now conforms more closely with military application requirements. TAB

N69-29842# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL INVESTIGATION OF THE INFLUENCE OF BOUNDARY LAYERS AND CERTAIN OTHER EFFECTS ON THE CHARACTERISTICS OF AN MHD GENERATOR
 A. E. Sheindlin et al Aug. 1968 31 p refs Transl. into ENGLISH of the publ. "Eksperimentalnoe Issledovanie Vliyaniya Pogranichnykh Sloev i Nekotorykh Drugikh Effektov na Kharakteristiki Mgd-Generators" p 1-31
 (AD-685536; FTD-MT-24-177-68) Avail: CFSTI CSCL 10/2

The paper deals with the results of research on the electrical characteristics of an MHD generator, carried out in a model power plant using the U-02 MHD generator. In this device was tested different types of MHD ducts which vary both in design and in the structural materials used for the electrodes and the insulating walls. As a result of this work the power of the generator was raised, to 42 kW and the operating time was taken to 100 hours. The maximum power extracted from a single pair of electrodes has reached 2.5 kW and the current density at the electrodes is 2.5 A/sq cm (in the short-circuiting regime). A great deal of experimental data was accumulated during the development and testing of the duct designs, and the paper is devoted to an analysis of this information. The object of study is a Faraday-type MHD generator with segmented electrodes, operating in a subsonic gas-dynamic regime. Author (TAB)

N69-29843# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTIMUM GEOMETRIC RELATIONSHIPS IN A COAXIAL LINEAR INDUCTION AND MHD GENERATOR
 N. M. Okhremenko et al Aug. 1968 27 p refs Transl. into ENGLISH of the publ. "Optimalnie Geometricheskie Sootnomeniya v Koaksyalnom Lineinom Induktsionnom Mgd-Generatore SM-107/174" USSR p 1/21
 (AD-685523; FTD-MT-24-173-68) Avail: CFSTI CSCL 10/2

Mathematical treatment of design problems for the asynchronous coaxial MHD generator with liquid-metal (Na, K) working fluid and unilateral or bilateral excitation at outputs of 5kw-150mw. TAB

N69-29892# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RAYLEIGH-TAYLOR INSTABILITY IN LIQUID-METAL

05 ENERGY CONVERSION

SYNCHRONOUS MHD GENERATORS AND METHODS OF STABILIZING IT

K. I. Kim 30 Aug. 1968 19 p refs Transl. into ENGLISH from Neustoychivost Releya-Teilora v Zhidkomet. Sinkhronnykh Mgd Generatorakh i Sposoby Yeye Stabilizatsii (USSR)

(AD-685487; FTD-MT-24-174-68) Avail: CFSTI CSCL 10/2

Use of piston-type flow in liquid-metal MHD systems is proposed in order to counteract Rayleigh-Taylor instability. Two main advantages are cited: (1) difficulties connected with acceleration are excluded inasmuch as the generating of electrical energy is guaranteed basically because of the gas expansion in the generator duct itself; flow rate can be more moderate, impossible in systems with continuous flow and noticeably reduced hydraulic losses; (2) in view of the small contact surface between liquid metal and gas and the low coefficient of temperature transfer of gas, a lower temperature of the thermodynamic cycle can be selected independently of the temperature of hardening of the liquid metal, consequently, there appears a possibility of a noticeable increase of the thermal efficiency of the cycle; (3) the possibility appears of realizing the powerful effective and technically perfected synchronous principle of conversion of flow kinetic energy into electrical energy. These features show that a liquid-metal MHD system with piston flow and with electrical energy takeoff by the synchronous principle will be high-power. Author (TAB)

N69-29923# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

EXPERIMENTAL INVESTIGATION OF ELECTRICAL CONDUCTIVITY OF PRODUCTS OF COMBUSTION, STIMULATED BY SOLID PARTICLES

E. P. Zimin et al 23 Aug. 1968 23 p refs Transl. into ENGLISH from Eksperim. Issled. Elektroprovodnosti Produktov Sgoraniya. Stimulirovannoy Tsvedymi Chastitsami (USSR)

(AD-685511; FTD-MT-24-183-68) Avail: CFSTI CSCL 10/2

An experimental study was carried out on the electrical conductivity of the products of combustion of methane with oxygen-enriched air in the presence of solid particles of various substances. This question merits attention in connection with the use of MHD electric power generators. By artificially introducing solid particles it was found possible to improve the electrophysical properties of the working gas. Solid particles transported from the combustion chamber may be present in the duct of an open-cycle MHD generator working with the products of coal combustion. In addition, when there are sufficiently large temperature reductions in the rear part of the duct, particles may form through the condensation of combustion product volatiles directly into the solid phase. The experiments showed that the introduction of particles stimulates the electrical conductivity of the products of methane combustion which, without particles, are non-conducting. The dependence of electrical conductivity on gas temperature and on particle size and the relative mass flow rate of the particles was studied. Author (TAB)

N69-30078# Commissariat à l'Energie Atomique, Limeil (France). STUDY OF THE ELECTRICAL BEHAVIOR OF VARIOUS MAGNETOHYDRODYNAMIC GENERATORS USING EXPLOSIVES [ETUDE DU COMPORTEMENT ELECTRIQUE DE DIFFERENTS GENERATEURS MAGNETOHYDRODYNAMIQUES A EXPLOSIF]

Jean Bernard and Jean-Claude Jouys Apr. 1969 80 p refs In FRENCH; ENGLISH summary (CEA-R-3714) Avail: CFSTI

This report concerns the electric behavior of several types of pulse generators which use the M.H.D. conversion of explosive chemical energy to supply experiments on plasma physics. Their electric parameters and behavior on ohmic and inductive loads are studied and compared. The electrical energy which appears on the

load is studied in respect of load and generator characteristics. Ways of amplifying the initial electric energy is also discussed.

Author (ESRO)

N69-30871*# Thermo Electron Corp., Waltham, Mass.

HYDROGEN-OXYGEN FIRED THERMIONIC GENERATORS AND THERMIONIC DIODES

3 Apr. 1969 67 p

(Contract NAS9-4282)

(NASA-CR-101745; TE-5045-145-69) Avail: CFSTI CSCL 20M

The hardware described in this paper served to evaluate the state-of-the-art of thermionic flame-heated devices for use in a short (a few hours to a few days) space mission. The reactants available as fuel and oxidant in the mission were expected to be hydrogen and oxygen, and these same reactants were employed in this work. Two hydrogen-oxygen 50 watt generators and two spare thermionic diodes were built. Although the generators were successfully operated, their efficiency was far below that initially expected. Self-bonded silicon carbide was the only material available that could resist the high temperatures and the thermal shock. This material was found highly permeable to hydrogen, and this precluded the design of a truly efficient combustor. Use of vapor-deposited silicon carbide, either free-standing or as a coating, is recommended as a way of circumventing the above difficulty in future devices. Author

N69-31249# Technische Hogeschool, Eindhoven (Netherlands). Afdeling der Elektrotechniek.

MHD POWER CONVERSION EMPLOYING LIQUID METALS

J. W. M. A. Houben and P. Massee Feb. 1969 34 p refs

(TH-69-E-06) Avail: CFSTI

The work described was performed in the field of MHD generation of electricity by means of liquid metals. It is shown that the study of two-phase flows is essential in this topic of research. Two types of generators which can be utilized with liquid metals were studied. The results are described. A short survey of the prospects of other liquid metal systems, which emerge from a study of the literature, is given. Finally, conclusions are drawn concerning possibilities for further investigation. Author

N69-32347# Defense Documentation Center, Alexandria, Va. MAGNETOHYDRODYNAMIC GENERATORS, VOLUME 1 Report Bibliography, 1953-1968

Mar. 1969 259 p

(AD-686000; DDC-TAS-69-5-Vol-1) Avail: CFSTI CSCL 10/2

This is Volume I of a two-volume set on Magnetohydrodynamic Generators (MHD). It has been prepared from the DDC collection and covers a period from 1953 to December 1968. It contains 211 unclassified and unlimited references and computer generated indexes of Corporate Author-Monitoring Agency, Personal Author, and Contract number. Author (TAB)

N69-32553*# General Electric Co., Schenectady, N.Y. Research and Development Center.

CHARACTERISTICS OF A THERMIONIC CONVERTER WITH A CHLORIDE VAPOR DEPOSITED TUNGSTEN EMITTER (110) AND A NICKEL COLLECTOR

V. C. Wilson and S. P. Podkolski Washington NASA Aug. 1969 37 p refs

(Contract NAS3-8511)

(NASA-CR-1416; GESP-9001) Avail: CFSTI CSCL 10A

A chloride vapor-deposited (110) tungsten emitter with a vacuum work function of 4.96 eV was built into a 0.005-inch-spaced converter with a nickel collector. The I-V curves

for emitter temperatures of 1673°K to 2153°K are presented. The output power versus emitter temperature is compared with three other similar converters. This converter yielded almost the same output power as a converter with a single-crystal (110) tungsten emitter, 0.002-inch spacing and a molybdenum collector. The vapor-deposited (110) tungsten surface was found to be extremely stable. The collector work function was observed to decrease when the device was left at room temperature for one month. Author

N69-32804# Naval Radiological Defense Lab., San Francisco, Calif.

RADIOISOTOPIC POWER GENERATORS State of the Art Report

Francis J. Berlandi, Francis K. Kawahara, J. Kim, and V. E. Schrock Aug. 1968 340 p refs

(AD-687131; USNRDL-R/L-68-10) Avail: CFSTI CSCL 10/2

A state-of-the-art compilation of radioisotopic power generators are summarized with respect to fuels, conversion devices, and overall system design performance through 1966. The fuel data is listed according to isotope mass number. The conversion devices discussed are thermoelectric, thermionic, Brayton, Rankine, and Stirling cycles. The systems section lists the major features that characterize RPG units in use in this country. Author (TAB)

N69-32934# Centre d'Etude de l'Energie Nucleaire, Brussels (Belgium).

COMPILATION OF REFERENCES ON THE DIRECT CONVERSION OF HEAT INTO ELECTRICAL ENERGY

J. P. Contzen and P. Bemelmans Jul. 1968 208 p refs In FRENCH

(BLG-427) Avail: AEC Depository Libraries

A collection of a little over one thousand references is presented, dealing with the production of electrical energy by direct conversion from a heat source. The period of time covered extends up to the years 1963-1964. The references are sorted out under main headings and subheadings, according to the conversion mode and to the particular aspect investigated. Author (NSA)

N69-34199# Akademiya Nauk URSR, Kiev. Inst. Teoreticheskoi Fiziki.

EFFECT OF ELECTRON SCREENING ON THERMONUCLEAR REACTIONS UNDER HIGH DENSITIES

V. V. Porfirev and Yu. N. Redkobodiyi 1969 30 p refs

(ITF-69-7) Avail: AEC Depository Libraries

The effect of electron screening of the Coulomb field of nuclei, which increases the thermonuclear fusion rate, is considered. The effective potential is derived by means of the self consistent field method based on the Hartree-Fock approximation. The influence of reacting nuclei on distribution of the screening space charge of electrons is taken into consideration. The screening contribution to interaction energy of colliding nuclei depends essentially on the self energy of the screening electron cloud. The results differ greatly from the results of other authors. Author (NSA)

N69-34810# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

INSTITUTE FOR DIRECT ENERGY CONVERSION Status Report

Dec. 1968 62 p refs (Grant NGL-39-010-001)

(NASA-CR-103989; INDEC-SR-15) Avail: CFSTI CSCL 07D

CONTENTS:

1. MATERIALS ENGINEERING 18 p refs
2. PLASMA ENGINEERING 13 p ref

3. ELECTROCHEMICAL ENGINEERING 17 p ref

N69-34812# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

PLASMA ENGINEERING

In its Inst. for Direct Energy Conversion Dec. 1968 13 p ref

Avail: CFSTI CSCL 20D

Thermoelectric properties of barium-graphite compound synthesized by diffusion anneal are discussed. The lattice parameters of C_6Ba were determined by Debye-Sherrer techniques. The MHD flow in an annular gap, basic surface investigations, and a materials study of silicon solar cells are also reported. J.A.M.

N69-34813# Pennsylvania Univ., Philadelphia. Inst. for Direct Energy Conversion.

ELECTROCHEMICAL ENGINEERING

In its Inst. for Direct Energy Conversion Dec. 1968 17 p ref

Avail: CFSTI CSCL 07D

Using the bilinear transformation of coordinator, the cylindrical configuration was reduced to one of concentric circles for which the current distribution was solved and expressed in the original geometry in terms of simple analytical expressions. This was applied to fuel cell designs. The improved design of the foam fuel cell was used for anodic oxidation studies of hydrogen in 4N H_2SO_4 on bright, smooth platinum electrodes. The iodine cathode composed of graphite and magnesium in fuel cells is discussed, including its leadage which was a major retarding factor due to the incompatibility of most materials with iodine. Overpotential transients on the rotating disk are also assessed. J.A.M.

N69-34989# Avco Corp., Wilmington, Mass. Government Products Group.

ISOTOPE REENTRY VEHICLE DESIGN STUDY PRELIMINARY DESIGN: PHASE 2 Final Report

Richard L. Ryan and John W. Graham Aug. 1969 466 p refs

(Contract NAS3-10938)

(NASA-CR-72555; AVSD-0306-69-RR) Avail: CFSTI CSCL 22B

Preliminary design efforts to develop a 25 kW_t (end-of-life) Pu 238 heat source Isotope Reentry Vehicle (IRV) are summarized. The emphasis was placed on feasibility and safety considerations. Heat source and heat source exchanger concept combinations were developed, and three of the more promising combinations were evaluated at the conceptual design level. The analytical evaluation included systems analysis, reentry performance, and heat source design as well as IRV heat shield, aeroshell structure, and thermal control. Design, performance, insulation, and structural details of the heat source heat exchanger were considered. The integration of the IRV system with the Brayton cycle power system, overall integration with the spacecraft, and ground handling requirements were also analyzed. K.W.

N69-35224# Forsvarets Forskningsanstalt, Stockholm (Sweden). **ELECTRICAL POWER PRODUCTION BY MEANS OF MHD, PRESENT SITUATION AND FUTURE PROSPECTS [ELKRAFTPRODUKTION GENOM MHD, NUVARANDE LAEGE OCH FRAMTIDSUTSIKTER]**

E. Witalis Nov. 1967 14 p In SWEDISH

(FOA-4-C-4325-55) Avail: CFSTI

The research during recent years on magnetohydrodynamic energy conversion for commercial electric power production is briefly reviewed. Power requirements, costs, and efficiency of MHD generators are compared with conventional power generating systems. Experimental open-loop MHD generators, the closed-loop

05 ENERGY CONVERSION

system, gas transport, and future potentials are discussed in somewhat more detail. Potential applications on ships, in aircraft, and in spacecraft are also briefly considered. Transl. by K.W.

N69-36280# Army Foreign Science and Technology Center, Washington, D.C.

MAGNETIC SYSTEMS USING STEEL FOR MAGNETOHYDRODYNAMIC GENERATORS

O. B. Bull 17 Apr. 1969 17 p ref Transl. into ENGLISH from Iz. Vyssh. Ucheb. Zaved., Elektromekhan. (Novocherkassk), no. 12, 1967 p 1330-1340

(AD-688393; FSTC-HT-23-568-68) Avail: CFSTI CSCL 20/9

Several designs for magnetic systems which can be employed in a magnetohydrodynamic generator, used to convert heat energy directly into electrical energy are analyzed. A design method is described for an annular magnetic system, the results of calculations are shown, and the system is compared in its basic parameters with a rectilinear magnetic system intended for a magnetohydrodynamic generator of the same power. Author (TAB)

N69-35732*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ANALYTICAL AND EXPERIMENTAL STUDIES OF MHD GENERATORS CATHODES EMITTING IN A "SPOT" MODE

Lester D. Nichols and Maris A. Mantieniks Washington Sep. 1969 refs

(NASA-TN-D-5414) Avail: CFSTI CSCL 20I

The sheath current-voltage characteristics for a plane cathode emitting current from a thermionic arc spot are derived. The derivation is based upon the requirement of energy conservation at the cathode spot and also in an ionization region adjacent to the spot. The results for given gas conditions and electrode work function predict a sheath voltage which decreases with both increasing current for a fixed undisturbed (i.e., far from the spot) cathode temperature, and increasing disturbed cathode temperature at a fixed current. Experimental data is shown which supports the conclusions predicted by the model. Author

N69-35785# Aktiebolaget Atomenergi, Stockholm (Sweden). **THERMODYNAMIC ANALYSIS OF A SUPERCRITICAL MERCURY POWER CYCLE**

A. S. Roberts, Jr. Apr. 1969 26 p refs

(AE-355) Avail: CFSTI

A heat engine is considered which employs supercritical mercury as the working fluid and a magnetohydrodynamic (MHD) generator for thermal to electrical energy conversion. The temperature range is approximately 300 to 2200°K and system pressure is 1500 atm. Equilibrium and transport properties are carefully considered since these are known to vary radically in the vicinity of the critical point, which is found near the supercritical states of interest. A maximum gross plant efficiency is 20% with a regenerator effectiveness of 90% and greater, a cycle pressure ratio of two, and with highly efficient pump and generator. However, certain specified cycle irreversibilities and others such as heat losses and heat exchanger pressure drops, which are not accounted for explicitly, reduce the gross plant efficiency to a few per cent. Experimental efforts aimed at practical application of the power cycle are discouraged by the marginal thermodynamic performance predicted by this study, unless such applications are insensitive to gross cycle efficiency. Author (ESRO)

N69-37703*# National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

REVIEW OF LIQUID-METAL MAGNETOHYDRODYNAMIC ENERGY CONVERSION CYCLES

Frederick H. Morse (Maryland Univ., College Park) Aug. 1969 53 p refs

(NASA-TM-X-63671; X-716-69-365) Avail: CFSTI CSCL 10A

Interest in liquid-metal magnetohydrodynamic (LM MHD) power generation has developed because of its high power density, its ability to operate both ac and dc generators, and the possibility of operation at moderate temperatures. Recent efforts and advances in LM MHD have made the evaluation of such systems for spacecraft power supply feasible. In this report all of the reported LM MHD power generation cycles are described and their efficiencies compared. A brief summary of the evolution and status of the LM MHD power generation systems and a listing of facilities engaged in LM MHD is also included. Author

N69-37883*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

EFFECT OF ELECTROTHERMAL INSTABILITIES ON BRAYTON- AND RANKINE-CYCLE MAGNETOHYDRODYNAMIC SPACE-POWER GENERATION SYSTEMS

Allan R. Bishop and Lester D. Nichols Washington Oct. 1969 18 p refs

(NASA-TN-D-5461) Avail: CFSTI CSCL 10B

Plane wave electrothermal instabilities are included in the analysis of idealized Brayton- and Rankine-cycle magnetohydrodynamic generators. It is shown that the instabilities cause an increase in Joule heating and a reduction in output power. An increase in the magnetic field can compensate for the reduction in output power. Author

N69-38033# Sandia Corp., Albuquerque, N.Mex. Aerospace Radioisotope Power Information Center.

SELECTED THERMOELECTRIC, THERMIONIC, AND ELECTRON-VOLTAIC ENERGY CONVERSION DEVICE CHARACTERISTICS

H. J. Gerwin (comp.) May 1969 27 p refs Sponsored by AEC (SC-ARPIC-1011) Avail: CFSTI

Information on thermoelectric, thermionic, and electron-voltaic energy conversion devices that are commercially available or are in the prototype stage of development is presented. Included are certain devices for use in space, terrestrial, and marine environments. Technical data, applications of devices, and general cost information are included. Author (NSA)

N69-38606# Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

POTENTIAL OF USING MIXED FISSION PRODUCTS AS A SOURCE OF ENERGY

D. W. Bolme Jun. 1969 54 p refs

(Contract AT(45-1)-1830)

(BNWL-1115) Avail: CFSTI

The amount of mixed fission products (waste byproducts obtained in the chemical reprocessing of nuclear fuels) potentially available through the year 2000 was estimated, their probable characteristics when packaged in a form suitable for long term storage described, and the potential usefulness of these packages as sources of thermal and gamma (radiation) energy assessed. The amounts potentially available depend upon the development of the nuclear (electric) power industry. Initial availability could be as early as 1975, substantial amounts (4800 packages per year) are expected to be available in about 1990. Packaging the waste will consist of converting the waste to a solid and depositing the solid in a metal cylinder which would then be welded shut. Author (NSA)

N69-38756*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE BASIC PRINCIPLES FOR OPTIMUM SHIELDING OF NUCLEAR APPARATUS ON BOARD SPACECRAFT

L. N. Veselovskiy et al. *In its Probl. of Space Biol.*, Vol. 6 Jul. 1969 p 532-539 refs (See N69-38701 23-05)
 Avail: CFSTI CSCL 181

Principles for planning protection from nuclear apparatus on board spacecraft are established; the necessity is shown for changing and supplementing the approaches for designing shielding of stationary nuclear reactors. Particular attention is given to the selection of criteria for radiation safety. These criteria are highly important in formulating the problem of optimization of the shield, for the purposes of achieving its minimum possible weight. The principles presented in the article allow for considering the particular features of using reactors on board the spacecraft.

Author

N69-39863# Florida Univ., Gainesville. Dept. of Nuclear Engineering Sciences.

STUDY OF NUCLEAR SEEDED MHD PLASMAS Yearly Summary Technical Report No. 3, 1 May 1967-31 Nov. 1968

William H. Ellis Nov. 1968 339 p refs

(Contract Nonr-580(18))

(AD-690542) Avail: CFSTI CSCL 20/9

The characteristics of MHD working media are investigated from several different aspects. A new method for studying electron kinetics in plasmas produced by neutron irradiation of He3, the pulsed ionization chamber technique, is described in detail. Plasma production and loss coefficients for a range of helium gas pressures from 1-10 atmospheres are presented for steady state plasmas measured by this technique. The dynamics of the diffusion and recombination of ion columns are investigated analytically and numerically. The systematics of the formation of a quasineutral plasma in a hydrodynamic channel flow are considered. Also studied are the required nuclear properties of a reactor system for use with the nuclear seeding technique of MHD plasma production.

Author (TAB)

N69-39898*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRIODE THERMIONIC ENERGY CONVERTER

Alex Vary, inventor (to NASA) Issued 27 May 1969 (Filed 22 Oct. 1965) 7 p Cl. 310-4

(NASA-CASE-XLE-1015; US-Patent-3,446,997;

US-Patent-Appl-SN-502746) Avail: US Patent Office CSCL 10A

A new and improved vacuum thermal-to-electrical energy converter is described which converts heat energy directly into electrical energy. The converter has three electrode elements, namely an emitting, a collecting, and a biased electrode; they are geometrically arranged and electrically interconnected in such a manner as to utilize the short circuit characteristics of the converter to increase substantially the electron transmission and hence the energy conversion efficiency of the converter. The electron-emitting electrode is located adjacent to the collector electrode, which has openings allowing electrons to pass and impinge on the bias electrode. The bias and emitter electrodes are directly connected, causing a short circuit condition in which the converter operating point is located on the high current portion of the converter's output characteristic curve. The collector bleeds off some of the electron flow and diverts it to a variable load impedance connected between collector and emitter electrodes, thereby energizing the load impedance. The electrodes may be flat or cylindrical and may be arranged in-parallel or coaxially.

NASA

N69-39983*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SLUG FLOW MAGNETOHYDRODYNAMIC GENERATOR

Yih-Yun Hsu, inventor (to NASA) and John W. Dunning, Jr., inventor (to NASA) Issued 1 Jul. 1969 (Filed 27 Jul. 1966) 5 p Cl. 310-11

(NASA-Case-XLE-2083; US-Patent-3,453,462;

US-Patent-Appl-SN-568362) Avail: US Patent Office CSCL 10B

A magnetohydrodynamic generator in which a heated nonconductive gas of high kinetic energy and a liquid metal mist of high kinetic energy are directed from a mixing chamber to a magnetohydrodynamic generator in such proportions that the liquid metal coalesces into slugs of metal. The slugs of metal are separated by pockets of the nonconductive gas whose kinetic energy aids in the movement of the slugs through the magnetohydrodynamic generator to generate an electric current at output electrodes of the generator. After leaving the generator, the slugs of metal are separated from the nonconductive gas. The liquid metal and the gas are recirculated through suitable heat exchangers to increase their respective kinetic energies.

Official Gazette of the U.S. Patent Office

N69-40031# California Univ., Berkeley. Coll. of Education.

HEAT TRANSFER FROM RADIOISOTOPIC POWER SOURCES IN POROUS MEDIA

V. E. Schrock, T. Fernandez, S. Garribba, and S. Narra Jun. 1968

96 p refs

(Contract N00228-68-C-0554)

(AD-691213; NE-68-1) Avail: CFSTI CSCL 18/14

Heat transfer from radioisotopic full fuel capsules was studied experimentally and analytically for the situation in which the capsule is buried in a porous earth material saturated with water as would occur when such a capsule becomes accidentally buried in the ocean floor. Experimental conditions have been extended beyond the range reported previously by testing devices with different length-diameter ratios and using a greater range of burial depths. The previously reported correlation for natural convection has been modified to include the greater range of parameters and the effect of length to diameter ratio. Theoretical treatment of the free convection case has been studied to establish the validity of the basic equations governing the system. Data have been obtained and analyzed for the nucleate boiling regime. Additional data have been obtained for the dryout condition and on the formation of crusts on the capsule.

Author (TAB)

N69-40586# Commissariat à l'Energie Atomique, Saclay (France). Centre d'Etudes Nucléaires.

ONE VOLT ISOTOPIC MICROGENERATORS [LES MICROGENERATEURS RADIOISOTOPIQUES 1 VOLT]

Robert Bomal, Bernard Devin, and Philippe Delaquaize Jun. 1969

75 p refs In FRENCH; ENGLISH summary

(CEA-R-3834) Avail: CFSTI

Various configurations for electrical isotopic generators in the milliwatt range are investigated; these generators are not of the classical thermoelectric type. The four following energy conversion methods are examined: (a) Thermionic, (b) Thermophotovoltaic, (c) Radiovoltaic and (d) Wired thermoelectric. Calculations were conducted with the aim of obtaining directly 1 volt output voltage and not with the best energy conversion efficiency. High temperature ^{238}Pu sources (T above 1000°K) were isolated by multilayer thermal insulation materials of the Moly/Alumina type. Optimised application is given for (a) and (b) above. The thermionic method is interesting due to its compactness and the wired-thermoelectric one is cheap, simple and rugged. Both methods do not give output voltages far above 1 volt. The other two methods can be designed for multivolt application. The radiovoltaic one is 1 per cent efficient but irradiation defects in the semiconductor induced by high energy radiations can strongly limit the lifetime of the generator. Isotope source technology is the determining factor for these microgenerators.

Author (ESRO)

N69-40792# Naval Research Lab., Washington, D.C.

CONTROLLED THERMONUCLEAR REACTIONS: AN OCEAN OF ENERGY

R. Sagdeev 16 Jul. 1969 4 p Transl. into ENGLISH from Izv.

05 ENERGY CONVERSION

(Moscow), v. 52, no. 3, Jan. 1969 p 1-4

(AD-691465; NRL-Trans-1175) Avail: CFSTI CSCL 18/1

The paper is a brief discussion of progress being made toward using thermonuclear power. TAB

N70-10447# Army Electronics Command, Fort Monmouth, N.J. FAST TRANSIENT RESPONSE FUEL CELL-BATTERY HYBRID POWER SOURCE

Galen R. Frysinger Jan. 1969 5 p refs Presented at the Intern. Automotive Eng. Congr., Detroit, 13-17 Jan. 1969

(AD-692538) Avail: CFSTI CSCL 10/2

The integration of a molten carbonate fuel cell with a molten electrolyte battery both electrically and thermally produces a highly efficient power source with a fast transient response. Since most practical high pulse applications utilize electronic chopping circuits, microsecond and millisecond response characteristics of a power source are of importance. Ceramic monoblock construction of a hybrid package can be designed with optimum response characteristics as well as the ability to accept high reverse power flow. Author (TAB)

N70-11301# European Space Research Organization, Paris (France).

PROCEEDINGS OF THE SIXTH ESRO SUMMER SCHOOL, VOLUME 6: SPACE POWER SYSTEMS: INTRODUCTION

Jul. 1969 108 p refs Partly in FRENCH and partly in ENGLISH Conf. held at Noordwijk, Neth., 1968

(ESRO-SP-45) Avail: CFSTI

CONTENTS:

1. SPACE MISSION AND POWER SUPPLY REQUIREMENTS K. H. Heffels (ESRTC) p 1-23 refs

2. PRIMARY ENERGY SOURCES AND CONVERSION SYSTEMS K. H. Heffels (ESRTC) p 25-56 refs

3. ISOTOPIC ENERGY SOURCES H. Daspet (CNES, Brétigny) p 57-78 refs

4. NUCLEAR REACTORS AS A SOURCE OF POWER IN SPACE L. R. Shepherd (Atomic Energy Estab., Winfrith) p 79-108 refs

N70-11304# Centre National d'Etudes Spatiales, Brétigny-sur-Orge (France).

ISOTOPIC ENERGY SOURCES [LES SOURCES D'ENERGIE ISOTOPIQUE]

H. Daspet In ESRO Proc. of the 6th ESRO Summer School, Vol. 6: Space Power Systems: Introduction Jul. 1969 p 57-78 refs In FRENCH

Avail: CFSTI

After describing two kinds of energy sources the even-SNAP (fission) and the uneven SNAP (radio-active decay) the specific power of uneven SNAP and also conditions which the radio element must satisfy (cost, toxicity, life) are analyzed. Peltier and Thomson effects are discussed and the actual efficiency of the thermoelectric conversion is calculated. General characteristics of thermoelectric generators, of which SNAP is an example, lead to the conclusion that these devices are very suitable for long duration missions or for missions in shaded regions. The high cost of radioactive isotopes however will plead the case for use of solar generators for the missions which are at present envisaged. ESRO

N70-11305# Atomic Energy Establishment, Winfrith (England).

NUCLEAR REACTORS AS A SOURCE OF POWER IN SPACE

L. R. Shepherd In ESRO Proc. of the 6th ESRO Summer School, Vol. 6: Space Power Systems: Introduction Jul. 1969 p 79-108

refs

Avail: CFSTI

Three methods exist for converting the power generated in nuclear energy sources: the direct, the quasi-direct, and the indirect (or dynamic) methods. The direct method does not seem to be applicable to nuclear fission and is not discussed. The quasi-direct and indirect systems both work according to a thermodynamic cycle, but differ in that the quasi-direct system, using electrons for its working fluid, requires no moving parts, whereas the indirect system uses a material working fluid and thus needs rotating machinery. Indirect systems are discussed first and the use of conventional turbines considered. According to the level of power required, three possible arrangements are retained: a mercury Rankine cycle, noble-gas cycles, and MPD generators. Quasi-direct conversion is next discussed. The in-pile thermionic converter seems to be the most promising system for low-power ranges. In conjunction with the various conversion methods discussed, two types of moderated reactors are analysed, one employing graphite moderation and appropriate to the dynamic system, the other employing hydrogen or beryllium and appropriate to thermionic power conversion. It is concluded that the thermionic system, based on hydride-moderated reactors, could be designed with total mass of approximately one tonne and therefore suitable for a European launcher. As an alternative, a hybrid carbon/hydride reactor system with a gas turbine power cycle might be considered, while at very high power outputs the dynamic system might be more appropriate. Author (ESRO)

N70-11420# General Electric Co., Philadelphia, Pa. Space Sciences Lab.

INVESTIGATION OF A LARGE SCALE NON-EQUILIBRIUM MAGNETOHYDRODYNAMIC GENERATOR Annual Report, 1 Aug. 1968 31 Jul. 1969

B. Zauderer Aug. 1969 37 p

(Contract Nonr-3867(00))

(AD-693153) Avail: CFSTI CSCL 10/2

The report briefly summarizes efforts of the past contract year. The following tasks were completed: (a) Development of a uniform pre-ionization system; (b) Large scale MHD power generation in a non-equilibrium plasma; (c) Development of appropriate gas and plasma diagnostic methods for use in the MHD generator; (d) Development of a theoretical model to describe the generator performance; (e) Utilization of the above results to design and construct a new MHD channel. Author (TAB)

N70-11975*# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

STUDY OF A 300-KILOWATT RANKINE-CYCLE ADVANCED NUCLEAR-ELECTRIC SPACE-POWER SYSTEM

Jack A. Heller, Thomas A. Moss, and Gerald J. Barna Washington Nov. 1969 37 p refs

(NASA-TM-X-1919; E-5135) Avail: CFSTI CSCL 21F

A system analysis is presented for a nominal 300 kW electric potassium system employing a lithium-cooled fast reactor and with 2100 F (11420 K) turbine inlet temperature. Trends in performance and weight are discussed for variations in design parameters. Performance and design of major components are reviewed, including material considerations. A typical conceptual system layout is shown. Author

N70-12638# California Univ., Livermore, Lawrence Radiation Lab.

CONTROLLED THERMONUCLEAR POWER

R. W. Werner, B. Myers, J. D. Lee, and P. B. Mohr 27 Jun. 1969 13 p refs Presented at 4th Intersoc. Energy Conversion Eng. Conf., Washington, D.C., 17-19 Sep. 1969 Submitted for publication Sponsored by AEC

(UCRL-71500; CONF-690905-1) Avail: CFSTI

A review is given of the elements of controlled thermonuclear power, the physics of containing a hot plasma, and the variety of proposed machines usable for a reactor. A reference design for a power-producing reactor is discussed which uses a lithium blanket surrounding the hot plasma to absorb energy and allow regeneration of the tritium fuel consumed in the basic reaction. A magnet surrounds the lithium blanket to provide a field for containing the plasma. The energy produced proceeds through a thermal conversion cycle, although there is the potential for direct electrical conversion.

Author (NSA)

N70-13251# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE INTEGRAL CHARACTERISTICS OF AN MHD GENERATOR WITH DIVERGING ELECTRODES

I. V. Lavrentev 12 Mar. 1969 15 p refs Transl. into ENGLISH from *Elektrofizicheskaya Apparatura* (USSR), no. 6, 1967 p 83-93 (AD-694396; FTD-HT-23-1508-68) Avail: CFSTI CSCL 10/2

Edge effects in and integral characteristics of MHD-generators with a constant-cross-section channel and with finite-length electrodes were investigated. The article considers a MHD-generator whose working channel has radially diverging electrodes; both pressure and speed undergo drawdown. Formulas for the potential difference across the electrodes, usable power, Joules loss in the channel, and electrical efficiency are derived. Author (TAB)

N70-13293# Army Electronics Command, Fort Monmouth, N.J. Electronic Components Lab.

POWER SOURCES FOR LONG ECONOMIC LIFE COMMUNICATIONS EQUIPMENT

Galen R. Frysinger Jul. 1969 19 p (AD-693847; ECOM-3154) Avail: CFSTI CSCL 10/2

Because of the extended life and operating endurance of new electronic communications equipment, new power sources must be designed and developed which provide no-break operation and optimum costs over these extended operating periods. The concept of a rack-mounted power source as a utility tray component of an integrated shelter is described. Maintainability and life cycle costs are developed for silent static power generation systems in contrast to present engine-generator units. Author (TAB)

N70-13346# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMOELECTRIC POWER SUPPLIES

E. K. Iordanishvili Mar. 1969 199 p refs Transl. into ENGLISH from the Russian (AD-690786; FTD-MT-24-53-69) Avail: CFSTI CSCL 10/2

The monograph examines the contemporary state of the problem of research and development of the most effective thermoelectric materials and methods of commutation, methods of design and investigation of semiconductor thermoelements, and also materials related to the development and use of domestic and foreign thermoelectric units, hydrometeorological, ground and space assignments. A special place is dedicated to a consideration of different aspects of the design, creation and application of cascade thermoelements, which at present play an important role in methods of thermoelectric generation of electric power. Inclusion of chapters expounding thermodynamic theory of thermoelectric generators and thermoelectric phenomena gives scientists and engineers a sufficiently full account of the whole contemporary state of this area of science and technology. The concluding part of the monograph examined prospects of the application of thermoelectric units of different designations and their possible combination with units which use other methods of direct conversion of thermal energy into electrical. A thematic bibliography complete up to 1967 embraces basic domestic works in the area of thermoelectric materials, thermoelements and thermoelectric units. TAB

N70-13927# Politecnico di Torino (Italy). Centro Studi Motorizzazione Agricola.

POSSIBILITIES AND PROBLEMS OF GAS TURBINE APPLICATION FOR GROUND MOTION MACHINES [POSSIBILITA E PROBLEMI DELL'APPLICAZIONE DELLE TURBINE A GAS ALLE MACCHINE PER MOVIMENTO TERRA]

Gianni Rigamonti and Fiorenzo Morra (Fiat) Assoc. Tec. Automobile Jun. 1969 19 p refs In ITALIAN Sponsored by Consiglio Nazl. delle Ric. /ts Ric. ATA, Quaderno 69, Suppl. to No. 6

(Publ-18) Avail: CFSTI

The present state of development of gas turbine engines for surface propulsion through a mechanical transmission is outlined. The space/power and weight/power relationship and the operational characteristics are discussed, as well as the utilization of the prime mover as a power supply to the auxiliaries. For gas turbine drives special systems of motor braking must be devised and new problems are encountered in installation, noise level, air filtering and exhausts. ESRO

N70-14220*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TURBINE PERFORMANCE IN A GAS-BEARING BRAYTON CYCLE TURBOALTERNATOR

Joseph S. Curreri, Roman Kruchowy, and James C. Wood Dec. 1969 16 p refs

(NASA-TN-D-5604) Avail: CFSTI CSCL 10A

The performance characteristics of the turbine for a gas-bearing Brayton cycle turboalternator were experimentally determined and compared with design predictions. Design operating conditions were inlet temperature, 1225 F; inlet pressure, 8.45 psia; total-to static-pressure ratio, 1.26; and shaft speed, 12 000 rpm. Performance data were obtained over a range of pressure ratios from 1.1 to 1.4 and at speeds of 10 000, 12 000, and 14 400 rpm. Author

N70-14488# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CERTAIN DESIGN PECULIARITIES OF AUTOMOTIVE GAS TURBINES

Yu. I. Frieman et al 22 May 1969 20 p refs Transl. into ENGLISH from *Akad. Nauk SSSR, Izv. Energ. i Transp. (USSR)*, no. 2, 1968 p 40-47

(AD-694842; FTD-MT-24-521-68) Avail: CFSTI CSCL 21/5

This paper examines design characteristics of automobile gas-turbine engines: the engines almost always operate at considerably below rated power and over a wide rpm range and they are often shifted from mode to mode and therefore must have good pickup. A twin-shaft turbine with heat exchanger is considered, but almost everything discussed applies to any automobile gas-turbine engine. It is shown that the rated pressure increase in the compressor must ensure minimum specific fuel consumption under average operating conditions. Selection of the basic engine parameters on the basis of minimum total cost per unit of transport work is proposed as a general approach to design. Author (TAB)

N70-14518# Oak Ridge National Lab., Tenn.

SPACE HEATING IN URBAN ENVIRONMENTS

A. J. Miller In *AEC Abundant Nucl. Energy* May 1969 p 219-237 refs

Avail: CFSTI

A preliminary study indicates that in 1980 the heat from a nuclear energy center in or near a large city could be used to heat and to air-condition a large portion of the city at a cost per unit of heat equivalent to that now incurred by district heating in downtown commercial and high-rise apartment areas. The heat used would be from steam out of back-pressure turbines and turbine

05 ENERGY CONVERSION

bleed rather than from prime steam, and thus the waste of heat from the plant generating electricity would be reduced or largely eliminated. Such a system would reduce both chemical pollution of the air and thermal pollution of streams. Author (NSA)

N70-14933# Stanford Univ., Calif. Plasma Physics Lab.
EFFECTS OF ELECTRODE SIZE ON THE PERFORMANCE OF A COMBUSTION DRIVEN MHD GENERATOR Technical Report Jul. 1966 Jul. 1969

Edward Stephen Rubin Aug. 1969 151 p refs

(Contract F33615-67-C-1127)

(AD-694039: AFAPL-TR-69-72) Avail: CFSTI CSCL 10/2

A single molybdenum electrode pair, shielded from end effects by two additional electrode pairs, was located at the downstream end of an MHD channel. Two types of experiments were performed. First, the effects of electrode size on performance was examined at electrode temperatures between 530K and 1600K for a fixed channel geometry, combustion gas mass flow rate, magnetic field strength, and upstream wall temperature (2200K). Three electrode sizes were used (length-to-pitch ratios of 0.2, 0.5, and 0.8), and performance was evaluated directly from electrode voltage drops determined as a function of current. The second type of experiment investigated electrode size effects in the presence of dissimilar boundary layer conductivities, reflecting coupling between electrode and gas boundary layer temperatures in a cold-electrode generator. A hot wall was used upstream of small electrodes and a cold (750K) wall upstream of large electrodes. For similar conditions of surface and gas boundary layer temperature, larger electrodes were found to yield lower voltage losses at a given load current. However, for dissimilar boundary layers, total voltage losses for a large electrode pair were equal to or greater than those of a small electrode pair at the same surface temperature.

Author (TAB)

N70-15650# Avco-Everett Research Lab., Everett, Mass.

RESEARCH ON INERT GAS MFD ENERGY CONVERSION Final Report

Jean F. Louis Wright-Patterson AFB, Ohio. ARL May 1969 116 p refs

(Contract AF-33(615)-3413)

(AD-694529: ARL-69-0076) Avail: CFSTI CSCL 10/2

The report contains a discussion of the results of a research program to determine the bulk properties of plasmas in the MFD disk generator driven by a high temperature, large mass flow, alkali shock tunnel. Also, the performance of the MFD disk generator is examined as a promising high Hall coefficient, high power density MFD power generator. Specifically, the study phases are: Theoretical studies of two-temperature plasmas operating at high Hall coefficients; one-dimensional analysis of non-equilibrium flows in a MFD disk generator; theoretical study of the MFD disk generator as a practical power generator; description of the large MFD generator facility; experimental studies of high Hall coefficients in an argon-driven generator; experimental studies of an argon-driven generator with upstream pre-ionization; experimental studies of a nitrogen-driven generator.

Author (TAB)

N70-16217# Advisory Group for Aerospace Research and Development, Paris (France).

SPACE POWER SYSTEMS, PART 1 Lecture Series

Nov. 1969 348 p refs Presented at Brussels, 2-6 Oct. 1967

Sponsored by AGARD

(AGARDograph-123-Pt-1) Avail: CFSTI

CONTENTS:

1. SIMILITUDES AND LIMITATIONS IN TRANS-CONVENTIONAL PROPULSION SYSTEMS G. C. Szego (Inst. for Defense

Analyses, Arlington, Va.) p 1-19 refs

2. SPACE POWER SYSTEMS G. C. Szego (Inst. for Defense Analyses, Arlington, Va.) p 21 89 refs

3. NUCLEAR SPACE POWER SYSTEMS H. M. Dieckamp p 91-302 refs

4. MECHANICAL HEAT ENGINES FOR SPACE POWER SYSTEMS E. B. Zwick p 303 348 refs

N70-16220# Advisory Group for Aerospace Research and Development, Paris (France).

NUCLEAR SPACE POWER SYSTEMS

H. M. Dieckamp *In its Space Power Systems, Pt. 1* Nov. 1969 p 91-302 refs

Avail: CFSTI

A general discussion is given of previous nuclear power systems used in space. The nuclear system offers definite advantages of ruggedness, high power per unit area, no collector deployment, continuous power, minimum power storage requirements, and no orientation, factors which limit the use of batteries and other chemical systems. As the power requirements are increased to the order of tens of kilowatts, the nuclear reactor systems have an increasingly favorable weight, size, and cost advantage over any of the presently envisioned solar power systems. The Systems for Nuclear Auxiliary Power program is discussed within the context of increased power requirements to fill future needs. R.B.

N70-16221# Advisory Group for Aerospace Research and Development, Paris (France).

MECHANICAL HEAT ENGINES FOR SPACE POWER SYSTEMS

Eugene B. Zwick *In its Space Power Systems, Pt. 1* Nov. 1969 p 303-348 refs

Avail: CFSTI

Mechanical Heat Engines represent an important class of energy conversion devices for power generation in space. Power levels ranging from kilowatts to megawatts can in principle be supplied by mechanical systems having high thermal efficiency and low total system weight. The use of mechanical systems is particularly attractive because of a solid foundation of thermodynamic principles and component development. Only materials problems are a significant obstacle in the development of mechanical power systems for space use. The heat engine concepts are reviewed which are of significance for space applications. A thermodynamic consideration is given to establish basic cycle characteristics and the relative importance of various factors such as temperature and component efficiency on cycle performance. A number of cycles are examined in terms of the problem of optimizing a power system for use with a space vehicle. R.B.

N70-16224# Advisory Group for Aerospace Research and Development, Paris (France).

ALTERNATORS FOR SPACE POWER APPLICATIONS

Eugene B. Zwick *In its Space Power Systems, Pt. 2* Nov. 1969 p 371-396 refs

Avail: CFSTI

Dynamic space power systems normally use alternators as a means of converting mechanical to electrical energy. Direct current machines are usually unsuitable because of problems with brushes and commutators in a severe environment. Electrostatic machines are discussed briefly. Alternators used in missile and space power applications include many of the types already developed for ground power use. Requirements for very high temperatures, corrosive environments, and extremely high rotative speeds have led to innovations in alternator design. The new machinery which has been developed shows considerable promise for future application in both space and terrestrial use. Author

N70-16226# Advisory Group for Aerospace Research and Development, Paris (France).

ENGINEERING ASPECTS OF THERMIONIC ENERGY CONVERSION

Ned S. Rasor *In its Space Power Systems*, Pt. 2 Nov. 1969 p 415-441 refs

Avail: CFSTI

The status of thermionic converter development is outlined from the viewpoint of prospective engineering use. The research upon which the description is based is reviewed elsewhere. Also, a perspective of recent trends is taken in describing progress toward practical application, rather than a review of past work. Special attention is given the broadening spectrum of new approaches which have arisen in response to changes in requirements, especially when viewed on an international scale. The engineering utility of the present understanding, and the potential impact of research in progress, is illustrated by specific examples of their application in these new approaches. Author

N70-16227# National Aeronautics and Space Administration, Washington, D.C.

ELECTROCHEMICAL SPACE POWER SOURCES

Ernst M. Cohn *In AGARD Space Power Systems*, Pt. 2 Nov. 1969 p 443-501 refs

Avail: CFSTI CSCL 10B

Because of the convenience, efficiency, and simplicity of chemical energy storage combined with electrochemical production of electricity, galvanic batteries powered the first airborne and the first spaceborne on-board electrical systems. After a general discussion of electrochemical energy storage and electricity generation in space, the paper presents the thermodynamic and kinetic electrochemical basis for these devices, as well as criteria for selecting electrochemically active materials and estimating densities. The following three sections cover primary (single use) and secondary (rechargeable) equipment, either now being used or of potential usefulness in space. The last two sections relate some design criteria for space power systems and consider possible earth-bound applications of space-oriented electrochemical research and development. Author

N70-17851# Florida Univ., Gainesville. Dept. of Nuclear Engineering Sciences.

TRANSACTIONS OF THE SYMPOSIUM ON RESEARCH ON URANIUM PLASMAS AND THEIR TECHNOLOGICAL APPLICATION, 7-10 JANUARY 1970

1970 103 p refs

(Grant NGL-10-005-088)

(NASA-CR-107857) Avail: CFSTI CSCL 181

A total of 37 abstracts or long summaries of symposium papers are presented under the following main headings: concepts; containment, flow, and stability; properties of uranium plasmas; nucleonics and radiation; nuclear light bulb engine; MHD power generator; and nuclear lasers. Four other papers are treated in greater detail: (1) acoustic instability driven by absorption of radiation in gases, (2) gas-core nuclear rocket concept with fuel separation by MHD driven rotation, (3) thermal radiation absorption processes in gas core reactors, and (4) gas-core reactors for MHD power systems. D.L.G.

N70-18341# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHYSICAL AND TECHNICAL PROBLEMS OF DIRECT CONVERSION OF CHEMICAL ENERGY INTO ELECTRICAL

N. S. Lidorenko et al 25 Apr. 1969 22 p Transl. into ENGLISH from Akad. Nauk SSSR. Izv. Energ. i Transp. (USSR), no. 4, 1968 p 3-12

(AD-696497; FTD-MT-24-39-69) Avail: CFSTI CSCL 10/2

An analysis is made of the basic power aspects of the problem of developing fuel cells. From a physical energy point of

view the system of electrochemical generators (ECG) is examined on the basis of an analysis of three components-the ECG itself and the systems of accessories and automatic adjustment, the creation of which is combined with the solving of a number of specific problems. The most important of these problems are examined and the necessity of their overall solution is brought out. As an example of practical realization of these problems, data are cited for an electrochemical generator with polymeric hydrophobic electrodes. This generator has promise for application in ground transport equipment. An analysis is made of the technology of manufacture of electrodes, design of battery, and volt-ampere characteristics. Photographs are shown of a Soviet ECG with ion-exchange membranes and cermet electrodes. Author (TAB)

N70-18728# National Aeronautics and Space Administration, Washington, D.C.

CLOSED-CYCLE MAGNETOGASDYNAMIC POWER GENERATION

Lester D. Nichols *In its Plasmas and Magnetic Fields in Propulsion and Power Res.* 1970 p 65-84 refs

Avail: CFSTI CSCL 201

The principles of operation in magnetohydrodynamic (MHD) generators are investigated. One of the advantages of an MHD system is that it is considered simpler than turboalternators because of the lack of seals, bearings, and auxiliary equipment associated with rotating machinery. Discussed are the types of generators, both open and closed thermodynamic cycle; generator current-voltage characteristics; electron heating, effect of fluctuations, effect of impurities, and space power systems study. F.O.S.

N70-18729# National Aeronautics and Space Administration, Washington, D.C.

PLASMA HEATING AND CONTAINMENT

Warren D. Rayle, John J. Reinmann, J. Reece Roth, and Donald R. Sigman *In its Plasmas and Magnetic Fields in Propulsion and Power Res.* 1970 p 85-122 refs

Avail: CFSTI CSCL 201

The possibility of controlled thermonuclear fusion for space power and propulsion was studied. The required parameters for deuterium-tritium, or deuterium-helium-3 are shown as: temperature, 10 to the 8th power to 10 to the 10th power K; confinement time, 0.1 to 1.0 sec; density, particle/cubic meter, 10 to the 20th power to 10 to the 22nd power; magnetic field, T, 5 to 10. The major fusion research problems are considered to be plasma confinement, and plasma production and heating. The problems of plasma instability and ion heating are discussed. F.O.S.

N70-19190# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL PERFORMANCE OF A 2-15 KILOWATT BRAYTON POWER SYSTEM IN THE SPACE POWER FACILITY USING KRYPTON

David B. Fenn, James N. Deyo, Thomas J. Miller, and Richard W. Vernon Jan. 1970 35 p refs

(NASA-TM-X-52750) Avail: CFSTI CSCL 10A

A Brayton power system has been operated in a vacuum environment for 584 hours using krypton as the working gas. This investigation was the first operation of the complete Brayton power system. With the exception of the heat source and the heat sink (no radiator was used), the engine components represented flight-type hardware. The engine produced 9.2 kilowatts gross alternator power (7.8 kW estimated net engine power), a gross engine efficiency of 26 percent, and an estimated net engine efficiency of 22 percent at a turbine inlet temperature of 1400 F, a compressor discharge pressure of 44 psia, and a compressor inlet temperature of 80 F. Author

05 ENERGY CONVERSION

N70-19359# Sandia Corp., Albuquerque, N.Mex.

SNAP-19 RESIDUAL FIRE TEST

R. E. Berry Aug. 1969 63 p refs

(SC-DR-69-490) Avail: CFSTI

Two residual fire tests were performed on SNAP-19 test items to evaluate the response of the test items to a 30 minute JP-4 fire environment which produces a temperature of about 1850 F at 24 inches above the liquid level. The first test included only a SNAP-19 Dispersion System Generator. The second test included four test items, and each test item was positioned to provide specific fire information on that item. The items were: a Dispersion System Generator; a Dispersion System Capsule; an Intact Reentry Heat Source Generator System; and an Intact Reentry Heat Source Capsule. Author (NSA)

N70-19953# Oak Ridge National Lab., Tenn.

STABILITY OF TOKAMAKS

Edward G. Harris 16 Oct. 1969 21 p refs Sponsored by AEC

(ORNL-TM-2766) Avail: CFSTI

Following a conjecture by Morse and Freidberg, the stability of the Bennett pinch was investigated with a magnetic field parallel to the axis. Under certain conditions all instabilities may be eliminated except for localized MHD instabilities near the axis. According to a modified form of the Suydam criterion derived, the MHD instabilities are eliminated when the cylindrical Bennett pinch is bent into a torus and the toroidal beta is less than $(5/4) (r_{sub 0}/R)$ to the 2nd power, where $r_{sub 0}$ is the mean radius of the pinch and R is the major radius of the torus. It is suggested that Tokamaks may operate in this stable regime. Author (NSA)

N70-21100 National Lending Library for Science and Technology, Boston Spa (England).

INVESTIGATIONS INTO THE DYNAMICS OF A NUCLEAR CLOSED-CYCLE GAS TURBINE PLANT WITH HIGH TEMPERATURE REACTOR

K. D. Kueper 17 Dec. 1969 20 p refs Transl. into ENGLISH from Proceedings of the IFAC Symp. on Multivariate Control Systems, Duesseldorf, 7 - 8 Oct. 1968

(NLL-WH-Trans-271-(9091.9F)) Avail: Natl. Lending Library, Boston Spa, Engl.: 2 NLL photocopy coupons

A calculation model is described which was used to investigate the dynamic behavior of the nuclear power plant. Systems of equations are used to describe the plant operations and include models of the reactor, heat exchanger, and circuit. It is concluded that the plant can respond very quickly to changes in power requirements without essentially changing the reactor temperatures or the occurrence of instabilities in the circuit. D.L.G.

N70-21263# Army Electronics Command, Fort Monmouth, N.J.
PROCEEDINGS OF THE ANNUAL POWER SOURCES CONFERENCE, 20-22 MAY 1969

1969 186 p refs

(AD-696428) Avail: CFSTI CSCL 10/3

Topics included are: Fuel cells; Power processing; Primary batteries; Zinc-air batteries; Secondary batteries; Fuze power sources; Thermal energy conversion. TAB

N70-21895# Institut fur Plasmaphysik G.m.b.H., Garching (West Germany).

CALCULATION OF GAS PARAMETERS IN MHD GENERATORS [BERECHNUNG DER GASPAREMETER IN MHD-GENERATOREN]

H. Zinko Jun. 1969 26 p refs In GERMAN; ENGLISH summary (IPP-3/97) Avail: CFSTI

The variation of the gas parameters in ideal MHD generators with infinite electrode segmentation can be described by simple analytic relations if the current density, load factor, and magnetic

field are kept constant. The magnetoplasmadynamic equations derived under these conditions for three types of ducts (constant area, constant velocity, and constant Mach number) were applied by means of numerical computation to alkali rare gas mixtures with nonequilibrium conductivity. In this way, gas parameters such as pressure, temperature, density, and velocity, and electrical data such as current density, power density, and electrical conductivity were plotted as functions of the duct length. The properties and efficiency of the various types of ducts are discussed and compared. As an example of application, the efficiency and magnetic field strength are calculated as functions of the load factor and Mach number for MHD generator with a thermal power of 100 megawatt.

Author (ESRO)

N70-22218 Purdue Univ., Lafayette, Ind.

LIFETIME CONSIDERATION AND ECONOMIC EVALUATION OF A LARGE, FAST, BREEDER, MIXED FUEL CYCLE SYSTEM

Ivan Dale Green (Ph.D. Thesis) 1968 253 p

Avail: Univ. Microfilms: HC \$11.50/Microfilm \$3.00 Order No. 69-7449

The object of this work was to investigate the effect of fuel depletion in conjunction with the sodium void coefficient and to make an economic evaluation of a particular mixed fuel cycle design. In order to make a meaningful investigation and economic evaluation, a similar all plutonium reference fuel cycle design was chosen, and its lifetime and economic effects, calculated using identical methods, were compared to the mixed fuel cycle design. The net outcome was that the mixed system had a 16 percent lower total core sodium void coefficient at the beginning of core life. The sodium void coefficient of the mixed system, in the central core zone where the reference system has its largest void coefficient, was 60 percent lower than that of the reference system. As the higher isotopes build up, the sodium void coefficients of both systems decreased. The decrease was faster for the mixed system, for at the end of core life its total core sodium void coefficient was 50 percent lower than that of the reference system.

Dissert. Abstr.

N70-22247# Kernforschungszentrum, Karlsruhe (West Germany). Inst. fuer Reaktorbauelemente.

ROD HEATERS WITH INDIRECT RESISTANCE HEATING FOR SIMULATION OF NUCLEAR FUEL RODS [HEIZSTABE MIT INDIREKTER WIDERSTANDSBEHEIZUNG ZUR SIMULIERUNG VON KERNBRENNSTABEN]

V. Casal Mar. 1969 28 p refs In GERMAN

(KFK-894) Avail: AEC Depository Libraries

High load indirectly-heated heating rods were developed, instrumented, and tested for the simulation of nuclear fuel rods. They have the dimensions of the fuel rods of fast breeder reactors and exhibit at least the reactor rod output at the maximum cladding temperatures. With these instrumented rods, studies were made of the heat transfer of the fuel elements in air, steam, and water flows. The studies showed that the MgO insulated rods at surface temperatures of 700 C reach rod outputs of 300 W/cm. This can be increased in BN insulated rods at the same temperature to around 900 W/cm.

Author (NSA)

N70-22307# United Kingdom Atomic Energy Authority, Risley (England).

EQUICORE: A SPACE DEPENDENT CODE TO ASSESS THE NUCLEAR AND THERMAL PERFORMANCE OF SGHW AND SIMILAR REACTORS

A. Bicevskis and E. W. Hesse 1969 33 p refs

(TRG-1808) Avail: CFSTI

EQUICORE is a survey code written in Fortran 4 which deals with a pressure tube reactor core at equilibrium and calculates both the fuel burnup and the average RZ-power distribution with the corresponding channel coolant conditions across the core. The EQUICORE method calculates the flux field from the average

properties in the core which are obtained from hydraulic and burn-up calculations in representative channels across the core, the calculating sequence proceeding in an iterative manner. Since time dependence was eliminated and a realistic core representation was achieved in two dimensions the calculation is fast and the method is suitable for investigating many alternative designs and fuel management schemes. In addition the code has the facility for calculating the variation of power and flow during a time dependent burnup of a central channel surrounded by the previously determined equilibrium core properties. The EQUICORE code is at present fully operational and was used during a design study to investigate a range of core parameters. Author (NSA)

N70-22862*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. SPACECRAFT POWER

In its Space Programs Sum. No. 37-59, Vol. 3 31 Oct. 1969 p 90-127 refs

Copyright. Avail: CFSTI CSCL 10B

Examined are the following aspects of spacecraft power: (1) lightweight solar panels in combination with NiCd batteries for tracking and data relay satellite network; (2) design of heat sterilizable silver oxide-zinc battery; (3) heat generation measurements for Surveyor main battery by isothermal calorimeter with automatic read-out; (4) gravity effects on zinc electrode performance; (5) surface reactions during oxidation and reduction of alkaline silver electrode; (6) simulation of gamma ray spectrum and intensity from plutonium -238 source; (7) shielding requirements for radiation field around plutonium-238 source; (8) development of cylindrical thermionic energy converters operating on heat release from isotopic decay; (9) life endurance tests of lead-telluride multi-couple thermoelectric modules; (10) development of long life high-performance silver oxide-zinc battery; and (11) operational features and capabilities of radioisotope thermoelectric generator test laboratory. G.G.

N70-23985# Army Electronics Command, Fort Monmouth, N.J.

ULTRA-RELIABLE POWER PROCESSOR FOR HYDROCARBON-AIR FUEL CELL POWER SYSTEMS

Melvin S. Kosmin Nov. 1969 26 p refs

(AD-699311; ECOM-3197). Avail: CFSTI CSCL 10/2

A 50 ampere power processor for shelter mounted hydrocarbon-air fuel cell power systems is described. The processor converts raw fuel cell power to the precise, high quality power required by military communications-electronic equipment. It is characterized by high efficiency (greater than 90%), high reliability (10,000 hours MTBF), and light weight, accomplished through the use of advanced high frequency, current controlled, switch modulation techniques. Automatic protection of the fuel cell against overloads, reverse current, and undervoltage operation is provided. A unique function of the processor is that it optimally loads the fuel cell to aid in system bootstrapping for faster start-up. Current limiting allows parallel operation when higher power levels are required and provides a battery charging capability. Interface compatibility with the fuel cell, battery and load, and ancillary items are also discussed. Author (TAB)

N70-24132# Avco-Everett Research Lab., Everett, Mass.

COMPARISON OF EXPERIMENTAL AND ANALYTICAL RESULTS FOR A 20 MW COMBUSTION-DRIVEN HALL CONFIGURATION MHD GENERATOR

O. K. Sonju, J. Teno, and T. R. Brogan Nov. 1969 26 p refs (RR-344) Avail: CFSTI

The results of a continuing effort to upgrade "design" and "off design" analytical techniques for MHD generators are reported. The analytical techniques are applicable to all types of generators, but the work reported is primarily concerned with the analysis of Hall MHD generators. The analytical techniques used in the analysis

including boundary layer analysis, gas nonuniformity considerations, and electrode drop effects, are reviewed. As a check on the analysis, comparisons between predicted and observed operating parameters of a 20 MW Hall generator are made. Although some small discrepancies still exist, the correlation between predicted and observed performance is very good. The analysis is shown to predict the maximum loading (stalling point) of Hall generators accurately. Based on the conclusion that the analysis is quite accurate in view of the comparisons and checks made, it is felt that these analytical techniques can be used with some confidence to design and predict the performance of future MHD generators with a high degree of accuracy. Author

N70-25446*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

NUCLEAR POWER FOR MANNED ORBITING SPACE STATIONS

H. O. Slone and L. I. Shure 1970 17 p refs Presented at the Conf. on Aerospace Nucl. Appl., Huntsville, Ala., 28-30 Apr. 1970 (NASA-TM-X-52774) Avail: CFSTI CSCL 18E

The impact of using nuclear (reactor and isotope) power systems on space stations and space bases is discussed, and candidate nuclear power systems are compared. Much of the information presented is derived from the current NASA Phase-B space station studies. Author

N70-25577# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PLASMA PHYSICS AND PROBLEMS OF MAGNETOHYDRODYNAMICS IN THE TRANSFORMATION OF ENERGY

M. D. Millionschikov 2 Oct. 1969 28 p refs Transl. into ENGLISH from *Otkryti i Nauchnyi* (Moscow), 1967 p 217-236 (AD-699661; FTD-MT-24-154-69) Avail: CFSTI CSCL 10/2

Progress being made in creating magnetohydrodynamic generators in the Soviet Union is described. The article opens with a general discussion of the problems encountered in transforming the energy contained in chemical fuels into electrical energy. Efforts to overcome these problems have led to magnetohydrodynamic generators in which current is caused to flow in liquid, gas (plasma), or gas-liquid conductors moving through a magnetic field. Implementation of this principle has become possible in recent years due to development of good liquid and gas conductors, new heat-resistant materials, high temperature technology, the technology of superstrong magnetic fields, and large superconducting magnetic systems. Author (TAB)

N70-25623*# Ampex Corp., Redwood City, Calif.

DESIGN, FABRICATION AND TESTING OF A FOIL GAS-BEARING TEST RIG

L. Licht Washington NASA May 1970 78 p refs (Contract NAS3-11826)

(NASA-CR-1563; RR-69-9) Avail: CFSTI CSCL 13I

A sixteen-inch long rotor, weighing approximately twenty one pounds, was supported by air-lubricated foil bearings. In physical size and in mass distribution, the rotor was closely matched with that of an experimental Brayton cycle turboalternator unit. The rotor was stable in both the vertical and horizontal attitudes at speeds up to and in excess of 48,000 rpm. A detailed description of the experimental apparatus and of the foil bearing design are given. The report contains data of response of the rotor to rotating imbalance, symmetric and asymmetric, and to excitation by means of a vibrator (shake-table). It was demonstrated that the foil bearings accommodated thermal distortions and performed satisfactorily in the presence of appreciable temperature gradients along the journal. It is concluded that the gas-lubricated foil bearing suspension is stable and that it is endowed with superior distortion-conforming and wear characteristics. Author

05 ENERGY CONVERSION

N70-25646# Oak Ridge National Lab., Tenn.

A STUDY OF METALLIC URANIUM FUELED PRESSURIZED WATER REACTORS FOR THE PRODUCTION OF PROCESS HEAT OR ELECTRIC POWER

Truman D. Anderson, J. E. Jones, Jr., and C. M. Podeweltz Dec. 1969 237 p refs

(Contract W-7405-eng-26)

(ORNL-TM-2451) Avail: CFSTI

An investigation was made of the applicability of metallic uranium fuels to pressurized-water reactors. Both process-heat and power reactors were considered, but the primary emphasis was on process-heat reactors suitable for single-purpose desalting. The results indicate that the use of metal fuel may lead to the development of an advanced converter that retains most of the system technology of present light-water reactors. Conversion ratios of about 0.9 were obtained for both process-heat and power reactors. The high conversion ratios achievable with metal fuel could lead to reduced fuel-cycle costs and better utilization of ore resources and diffusion plant capacity. Several uncertainties must be resolved before metal fuel could become commercially useful. The most important of these uncertainties concerns the corrosion of uranium metal in water.

Author (NSA)

N70-26116*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH VOLTAGE GENERATION WITH A BETA ELECTROGENERATOR CELL

Charles A. Low, Jr. [1970] 26 p refs Proposed for presentation at 5th Intersoc. Energy Conversion Eng. Conf., ENERGY-70, Las Vegas, Nev. 21 Sep. 1970

(NASA-TM-X-52776) Avail: CFSTI CSCL 18N

The direct conversion of the radioactive decay energy of a beta emitter, cerium-144, into high voltage electricity has been investigated in a coaxial cylinder cell. A 100 curie beta source absorbed in a thin graphite band on a 28 centimeter inner cylinder constituted the energy source. The energy spectrum and the output voltage were measured with a semiconductor detector. At high vacuums the maximum voltage was limited to 50 to 75 kilovolts, even when the electrodes were preconditioned to a higher voltage. Introduction of argon at pressures near .0005 torr increased this voltage capability to about 200 kilovolts.

Author

N70-26208# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

MAGNETOPLASMA DYNAMIC (MPD-) CONVERTERS [MAGNETOPLASMA DYNAMISCHE (MPD-) WANDLER]

Walter Peschka, Horst Eitel, and Wilfried Saeger Nov. 1969 88 p refs In GERMAN; ENGLISH summary

(DLR-FB-69-85) Avail: CFSTI

Theoretical and experimental results on closed cycle inductive MPD-systems are given. Mercury vapor and argon were used as working fluids and high frequency discharges generated the plasma. Cryopumping systems were successfully used in the experiments. Some ideas for the further development of the experimental work are also given.

Author (ESRO)

N70-26388 National Lending Library for Science and Technology, Boston Spa (England).

COMPARISON OF THE ECONOMICS OF REPROCESSING BY DRY AND WET METHODS IN THE FRAMEWORK OF THE FUEL CYCLE OF BREEDER REACTORS

L. Thirlet 1969 22 p refs Transl. into ENGLISH from Energie Nucl. (Paris), v. 11, no. 5, Jul. 1969 p 298

(NLL-WINDSCALE-Trans-414-(9091.1)) Avail: Natl. Lending Library, Boston Spa, Engl.; 2 NLL photocopy coupons

In the example selected for the wet method, the solution of constructing a factory on one site alone is optimum with the

selected data and remains so when the rate of realization, factory lifetime, and beginning of reduction in investment costs are changed. When the cost related to factor operation increases, the solution of constructing a factory on a second site without curtailing operation of the first becomes optimal. If transport costs increase, the solution of division of materials to reprocess between two factories after construction of a first factory of modest size becomes optimal. Satisfying an expanding demand generally requires consideration of the effects of size by which industrial plants profit. The results described cover the limited geographic region of France, but it is concluded that the methods are suitable over a wider area.

R.B.

N70-26434# Rasor (Ned S.), Dayton, Ohio.

PRACTICAL ASPECTS OF FUNDAMENTAL RESEARCH IN THERMIONIC CONVERSION Final Technical Report, 1 Mar. - 1 Sep. 1969

Ned S. Rasor Dec. 1969 67 p refs

(Contract N00014-69-C-0279)

(AD-699944; NSR-1-1) Avail: CFSTI CSCL 10/2

The report summarizes a study of factors in basic thermionic converter research which are potentially important to the success of the engineering programs. An elementary phenomenology-based analytical description of cesium diode converter operation is formulated to serve as an intuitive bridge between the device engineering and physical electronic technologies. The theoretical description of the emission properties of surfaces immersed in cesium vapor is generalized and extended to explain effects of additives and impurities which have been poorly understood. Thermionic emission of negative cesium ions from the collector is explored as a possible mechanism causing anomalous effects at the collector. A synopsis of the interrelation of basic converter physics and thermionic reactor design is developed which indicates that substantial engineering advances are achievable primarily through reduction of electron energy losses in the converter.

Author (TAB)

N70-26947# North American Rockwell Corp., Canoga Park, Calif. Atomics International Div.

BASIC RESEARCH IN THERMIONIC ENERGY CONVERSION Technical Summary Report, 1 Aug. 1968 - 30 Nov. 1969

Charles Warner and Lorin K. Hansen Dec. 1969 102 p refs

(Contract Nonr-3192(00))

(AD-700945; AI-69-112) Avail: CFSTI CSCL 10/2

The program was directed toward an understanding of the fundamental processes occurring in thermionic energy converters and the effects of these processes on overall converter performance. A theoretical approach was studied for solving the equations which describe the wide spaced diode. In the past these equations have not been solvable with available techniques. With some reservations the new computer results agree with available experimental data. Secondly, the trapping of ions in potential wells was studied and a new criterion has been developed which relates parameters associated with double sheath emission barriers. This criterion will be useful in deciding the essential physics of converters operating below the knee of the I-V curve.

Author (TAB)

N70-28078# Joint Publications Research Service, Washington, D.C.

RESEARCH IN MAGNETOHYDRODYNAMICS SUMMARIZED

Andrei Nicolaide In Transl. on Eastern Europe Sci. Affairs, No. 102 4 Mar. 1970 p 9-11 Transl. into ENGLISH from Sinteia (Bucharest), 14 Jan. 1970 p 6

Avail: CFSTI

Magnetohydrodynamic pumps and generator concepts are briefly discussed, as well as research in the theoretical and practical development of MHD pumps and flowmeters.

S.S.

N70-28433* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

DESCRIPTION AND EVALUATION OF DIGITAL-COMPUTER PROGRAM FOR ANALYSIS OF STATIONARY OUTSIDE COIL LUNDELL ALTERNATORS

Gary Bollenbacher Washington Jun. 1970 119 p refs (NASA-TN-D-5814) Avail: CFSTI CSCL 10B

A digital computer program for analyzing the electromagnetic design of Lundell alternators is presented. The program, which is written in FORTRAN 4 programming language, is briefly described. The calculational methods are outlined or appropriate references are cited. Calculated results for a 14.3-kVA alternator are compared with experimental data. The comparison identifies two sources of error in the program: the rotor leakage permeance, which affects the field excitation calculation; and the no load pole-face loss, which, if large compared to other losses, affects the accuracy of the efficiency calculation. Despite these sources of error, the agreement between calculated and experimental data is reasonable, and the program is useful for parametric analysis and design optimization.

Author

N70-29012* Florida Univ., Gainesville. Dept. of Nuclear Engineering Sciences.

DEVELOPMENT OF PLASMA DIAGNOSTIC METHODS APPLICABLE TO DIRECT ENERGY CONVERSION, SUMMARY Final Technical Report

Richard T. Schneider 1 Jan. 1970 29 p refs

(Contract Nonr-580(19))

(AD-702405) Avail: CFSTI CSCL 20/9

Contents: Time resolved diagnostics of a pulsed low pressure discharge; Pulsed electrodeless discharge in hydrogen; and a new approach for detecting of low photon fluxes in scattering experiments.

TAB

N70-29169* Illinois Univ., Chicago.

MAGNETOHYDRODYNAMIC INDUCTION GENERATOR EXPERIMENTAL STUDY Final Technical Report

15 Apr. 1970 45 p refs Prepared for JPL

(Contracts NAS7-100; JPL-952453)

(NASA-CR-110154) Avail: CFSTI CSCL 10B

The results of an experimental study of a one-wavelength MHD induction generator operating on a liquid flow are presented. The design philosophy and the experimental generator design are briefly summarized, including a description of the flow loop and instrumentation. The measurements without the fluid or fluid channel are given followed by the results obtained for the fluid flow without the magnetic field. Various generator test results are presented, including normal operation when excited from the 60 hertz power line, and operation from the power line with the end coils shorted to reduce magnetic fringing. Both cases were also operated in the self-excited mode with external capacitors to supply the required reactive power. The harmonic content of the terminal voltage was measured, hypothetical accidents simulated, and two-wavelength tests performed.

Author

N70-29364* Oak Ridge National Lab., Tenn.

ISOTOPES KILOWATT PROGRAM. TASK 1: CONCEPTUAL DESIGN AND EVALUATION

R. A. Robinson Jan. 1970 333 p refs

(Contract W-7405-eng-26)

(ORNL-TM-2366) Avail: CFSTI

Conceptual designs were prepared for several types of radioisotope electric power systems in order to determine which types of systems show the most promise for early development for terrestrial and undersea applications in the 2 kW(e) to 10 kW(e) power range. Strontium-90 titanate and Co-60 are considered as potential radioisotope fuels for the systems. The present development status of various energy conversion system components is reviewed.

Author (NSA)

N70-29518# Navy Space Systems Activity, Los Angeles, Calif. SPACE ELECTRICAL POWER SYSTEMS FOR THE MID-1970'S Final Technical Report

Richard V. Silverman Sep. 1969 125 p refs

(AD-701352; NSSA-R40-69-4) Avail: CFSTI CSCL 10/2

An evaluation of candidate electrical power systems capable of providing up to 6.5 kW for an earth orbiting mission is presented in this report. Three power systems could be ready for a mid-1970 launch, if proper funding were provided for development programs. They are: a Solar Cell/Battery System; a Reactor/Thermoelectric System; and a Reactor/Organic Rankine System. The preferred system for the proposed mission is the Reactor/Thermoelectric system, based on its inherent simplicity, lower weight, lower unit costs, and high degree of technology readiness relative to the competing systems.

Author (TAB)

N70-29729*# Pratt and Whitney Aircraft, East Hartford, Conn. RESEARCH ON THE PROPERTIES OF BINARY LIQUID METAL SYSTEMS WITH LITHIUM AS ONE COMPONENT: THE ELECTRICAL RESISTIVITY OF LIQUID LITHIUM SATURATED WITH CESIUM Final Report

F. F. Felber, Jr., S. M. Kapelner, and K. A. Helgeson 13 Feb. 1970 37 p refs Prepared for JPL

(Contract NAS7-658)

(NASA-CR-110370; PWA-3877) Avail: CFSTI CSCL 11F

The electrical resistivity of a saturated solution of cesium in liquid lithium has been measured in the temperature range from 770C to 1100 C by a high precision potentiometric technique and compared with the electrical resistivity of the same sample of liquid lithium measured independently in the same container. Matthiessen's rule is obeyed to approximately 900 C confirming the low solubility of cesium in liquid lithium. The impurity atom resistivity of cesium is less than one microhm-centimeter over this range, increasing to three microhm-centimeters at 1094 C. The temperature dependence of the electrical resistivity of a saturated solution of cesium in lithium can be expressed by the following equation: $\rho = 41.97 - 0.01585t + .00002271t^2$ sq where ρ is the electrical resistivity in microhm-centimeters and t is in degrees Centigrade. The electrical resistivity of the liquid lithium as a function of temperature in the temperature range 365 C to 973 C is: $\rho = 21.48 + 0.03170t - .000005913t^2$ sq. These results indicate that cesium solubility would not significantly alter the generator efficiency with liquid lithium as the conducting fluid in a lithium-cesium, two-component, two-cycle liquid metal MHD generator.

Author

N70-29864* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

STARTUP TESTING OF THE SNAP-8 POWER CONVERSION SYSTEM

Herbert G. Hurrell, Fred Boecker, Jr., and Kent S. Jefferies [1970] 14 p refs

(NASA-TM-X-52822) Avail: CFSTI CSCL 18N

SNAP-8 development has included extensive startup testing of the power conversion system coupled with a reactor simulator. Data are presented that show the power conversion system can be started in a dependable way. The temperature transients are well within the limits specified for the reactor. Procedures are discussed for the relatively fast transient to self-sustained operation and for the more gradual transient that achieves rated power output.

Author

N70-30407# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Elektrische Antriebe und Energieversorgung.

POSSIBLE SPACE APPLICATION OF NUCLEAR POWER SUPPLY, PARTICULARLY FOR DIRECT TV-BROADCASTING (EINSATZMOEGlichkeiten EINER NUKLEAREN ENERGIEVERSORGUNGSANLAGE IN DER RAUMFAHRT).

05 ENERGY CONVERSION

INSBES ONDERE FUER DIE FERNSEHDIREKTUEBERTRAGUNG]

W. Rasch, W. Kleinkauf, U. Krupstedt, A. Quast, and W. Scharf
Apr. 1970 393 p refs In GERMAN; ENGLISH summary
Sponsored by Bundesmin. fuer Bildung und Wiss.
(BMEV-FB-W-70-16) Avail: CFSTI; Zentralstelle fuer Luft
Fahrtokumentation und Inform. (ZLDI), Munich: 82 DM

Space application of an Incore-Thermionic-Reactor (ITR) is demonstrated by a direct broadcasting satellite. The electric power of the reactor (30 kW) is applied to the transmission of two TV-programs in the 800 MHz range using vestigial sideband modulation (5 kW transmission power for Central Europe). In addition, a 12 GHz broadcast is discussed. During the orbit transfer, the reactor supplies four Kaufman ion thrusters. The main components of the satellite, (power supply with a advanced cooling system, low voltage converter, electric propulsion system, and TV-payload) are described.
Author (ESRO)

N70-31239# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.

FAILURE DATA HANDBOOK FOR NUCLEAR POWER FACILITIES. A GUIDE FOR THE DESIGN, CONSTRUCTION, AND MAINTENANCE OF NUCLEAR POWER PLANTS FROM A RELIABILITY IMPROVEMENT STANDPOINT. VOLUME 1: FAILURE DATA AND APPLICATIONS TECHNOLOGY

15 Aug. 1969 735 p

(Contract AT(04-3)-700)

(LMCC-Memo-69-7-Vol-1) Avail: HC\$10.00/MF\$0.65

Records on past unscheduled events with systems and components in liquid metal cooled facilities are presented. The events relate to construction schedule or cost, safety, availability, or maintainability of a nuclear power plant or test facility. Broad topics include: failures occurring during facility operation; adverse events occurring prior to startup; reliability and availability analysis; and maintainability.
NSA

N70-31285# Institut fur Plasmaphysik G.m.b.H., Garching (West Germany).

MEASUREMENTS OF THE POTENTIAL AND CURRENT DENSITY DISTRIBUTIONS IN A SIMULATED FARADAY-TYPE MHD GENERATOR WORKING WITH ARGON-POTASSIUM PLASMA [MESSUNGEN DER POTENTIAL- UND STROMDICHTEVERTEILUNGEN IM ARGON-KALIUM-PLASMA EINES SIMULIERTEN FARADAY-MHD-GENERATORS]

J. Burger Dec. 1969 75 p refs In GERMAN; ENGLISH summary

(IPP-3/104) Avail: CFSTI

Potential distributions in a Faraday-type MHD-generator were measured with movable electrostatic probes in the generator duct to provide data on the relevant current distributions. The current lines and also the regions in which the current of the individual electrode pairs flowed were also determined. The measurements were made in a potassium seeded argon plasma with gas temperature 2000 K, gas pressure 1 atm and flow velocities of 55 - 115 m/sec. The maximum magnetic field intensity was 1.5 tesla and the average current density was 0.1 - 1.7 amp/sq cm.
ESRO

N70-31812# Atomics International, Canoga Park, Calif. Liquid Metal Engineering Center.

FAILURE DATA HANDBOOK FOR NUCLEAR POWER FACILITIES. A GUIDE FOR THE DESIGN, CONSTRUCTION, AND MAINTENANCE OF NUCLEAR POWER PLANTS FROM A RELIABILITY IMPROVEMENT STANDPOINT. VOLUME 2: FAILURE CATEGORY IDENTIFICATION AND GLOSSARY

20 Jun. 1969 191 p

(Contract AT(04-3)-700)

(LMCC-Memo-69-7-Vol-2) Avail: CFSTI

Records on past unscheduled events with systems and components in liquid metal cooled facilities are presented. The events relate to construction schedule or cost, safety, availability, or maintainability of a nuclear power plant or test facility. Broad topics include: system or component and failure category identification; and glossary.
NSA

N70-31999# General Electric Co., Philadelphia, Pa. Space Div. PERFORMANCE OF A LARGE SCALE NONEQUILIBRIUM MHD GENERATOR WITH RARE GASES

B. Zauderer Feb. 1970 68 p refs

(Contract Nonr-3867(00))

(AD-703314; DOC-70SD4; ONR-TR-14) Avail: CFSTI CSCL 10/2

An experimental study was performed of the operating characteristics of a large linear, supersonic MHD generator. A shock tunnel was used to heat the test gases, which was primarily a 99 percent neon + 1 percent xenon mixture, to stagnation pressures of 1 to 5 atmospheres, temperatures of about 3500K, and electron densities on the order of 10 to the 10th power /cc. The test time of 5 milliseconds, which was about 10 times the traversal time of the gas through the generator, was sufficient to produce quasi-steady state conditions in the channel. It was concluded that electrode conduction losses and shock wave formations were the two major factors limiting the efficiency of this generator.
Author (TAB)

N70-32771# Technische Univ., Berlin (West Germany). Inst. fuer Kerntechnik.

COMPARATIVE PERFORMANCE ANALYSIS OF LINEAR MPD GENERATORS

Gerhard Bartsch Sep. 1969 181 p refs In GERMAN

(TUBIK-15) Avail: AEC Depository Libraries

Different types of linear MPD generators are compared, considering power, efficiency, and load factors. Besides special operating conditions (i.e., maximum power or maximum efficiency operation) Hall effect, ion slip, and segmentation ratio are taken into account. These conditions are given separately and explicitly in calculations and diagrams. Thus, their influence on value and slope of parameters such as power and efficiency are distinct.
Author (NSA)

N70-32778# Tennessee Univ., Tullahoma. Space Inst. CURRENT DISTRIBUTION OF A SEGMENTED HALL GENERATOR

Y. C. L. Wu and J. F. Martin 13 Apr. 1970 25 p refs Presented at the 11th Symp. on Eng. Aspects of Magnetohydrodyn., Pasadena, Calif., 24-26 Mar. 1970

(Contract F44620-69-C-0031)

(AD-705160; AFOSR-70-1061TR) Avail: CFSTI CSCL 10/2

The paper describes an experimental and theoretical investigation of the current distribution in a segmented Hall generator with conductive side walls and insulating side walls respectively. The cathode emits in the arc mode; whereas the anode is an equi-potential. The current concentrates in the middle portion of the cathode and is very unsteady. The anode portion appears to be steady and the current spreads out somewhat evenly. The external load has little influence on the anode current distribution. In all load conditions, there is about 60% of the current flow into the anode, 15% flows to one side wall and 25% to the other side wall. The potential distribution on the anode side wall is linear and with a maximum potential drop of 40 volts. The cathode side wall appears to be an equi-potential surface.
Author (TAB)

N70-32986# Tennessee Univ., Tullahoma. Space Inst.
THE PERFORMANCE OF A FAMILY OF DIAGONAL CONDUCTING WALL MHD OPEN CYCLE GENERATORS

J. B. Dicks, Y. C. L. Wu, L. W. Crawford, J. K. Koester, J. W. Muehlhauser et al 13 Apr. 1970 16 p refs Presented at the 11th Symp. on Eng. Aspects of Magnetohydrodyn., Pasadena, Calif., 24-26 Mar. 1970

(Contract F44620-69-C-0031)

(AD-705159; AFOSR-70-1059TR) Avail: CFSTI CSCL 10/2

Experimental and theoretical studies were made of the performance of a 45 deg diagonal conducting wall generator and a Hall generator of the same physical dimensions. The wall temperature effect is investigated and an arc model is proposed. Aluminum was successfully burned in the combustor. It was found that the coating from burning of aluminum improves the channel performance due to the heating up of the walls. It was found that the fluctuations present in the Hall channel have much higher frequencies than those in the 45 deg DCW channel. The fluctuations grow along the channel in the Hall mode. The presence of the aluminum attenuates the fluctuations. The effect of the low conductivity nonuniformities in the plasma and the coating of the wall has a very profound effect on the performance of the Hall generator. Author (TAB)

N70-33216# Academy of Sciences (USSR), Moscow. Inst. Atomnoi Energii.

CERTAIN PROBLEMS OF THE EFFICIENCY OF POWER PRODUCTION IN MHD GENERATORS WITH A NONEQUILIBRIUM PLASMA

V. V. Breev, A. V. Gubarev, and V. A. Gurashvili 1968 66 p refs In RUSSIAN

(IAE-1701) Avail: AEC Depository Libraries

There is serious doubt as to the future of such machines with the linear condition (Faraday) sectioned generator most thoroughly studied, since the efficiency of the station does not exceed 40% using currently feasible field inductions of approximately 10 tesla, a reactor pressure of $> \text{ or } =$ to 500 atm, and a gas temperature of $< \text{ or } =$ to 2000 K, which are the technical limits for the next decade. Even under the most optimistic assumptions (T approximately 2500 K, $\beta = 10$ tesla, a high degree of heat regeneration, absence of thermal losses, etc.) for a reactor pressure of approximately 100 atm, a station efficiency of greater than 50% is achieved for a unit power of the MHD generator of $> \text{ or } =$ to $3 \times 1,000,000$ kW. The reason for such low efficiency is that the physical operating principles of the generator envisioned at the present time (ionization of the plasma, etc.) and the electrodynamic design of the generator make it impossible to obtain a high efficiency in the energy conversion process itself in the channel. NSA

N70-33335# Institute of Nuclear Research, Warsaw (Poland).
HALL TYPE MHD GENERATORS WITH NONUNIFORM GAS PARAMETERS ALONG THE CHANNEL AXIS

Z. Celinski 1969 39 p refs

(INR-1107) Avail: AEC Depository Libraries

Expressions are derived which enable one to calculate the electrical parameters of the generator when the gas parameters vary along the generator channel. The comparison between the calculated electrical parameters in the case of uniform and nonuniform gas parameters was also performed. Author (NSA)

N70-33547# Institute of Nuclear Research, Warsaw (Poland).
ELECTRICAL PARAMETERS IN THE FARADAY TYPE MHD GENERATOR WITH NONUNIFORM GAS PROPERTIES IN THE MAGNETIC FIELD DIRECTION

Z. Celinski 1969 76 p refs

(INR-1095) Avail: AEC Depository Libraries

The effects of gas velocity and temperature distributions in the direction of a magnetic field on the electrical parameters of the Faraday-type MHD generator are considered. As gas properties are varying along the z axis, circulating currents are flowing in the cross-sectional area of the channel due to the nonuniform distribution of the gas velocity. These currents induce the Hall circulating currents along the x axis. The ohmic losses due to the circulating currents are independent of the load factor. The maximum point of the efficiency curve versus load factor is shifted to the lower values of the generator loading. The weak Hall fields can be induced in the open circuit conditions of the generator due to the nonuniform distribution of the Hall parameter. A constant channel cross section, no-leakage currents in the walls, a constant magnetic field, as well as constant electrical and gasdynamical parameters along the channel, are assumed. It is also assumed that the distributions of the gas parameters are independent of the load factor. A numerical example is calculated. Author (NSA)

N70-33672# Institute of Nuclear Research, Warsaw (Poland).

ELECTRICAL PARAMETERS IN THE FARADAY-TYPE MHD GENERATOR WITH NONUNIFORM GAS PROPERTIES IN THE ELECTRIC FIELD DIRECTION

Z. Celinski 1969 69 p refs

(INR-1096) Avail: AEC Depository Libraries

The effects of gas velocity and temperature distributions in the direction of an induced electrical field, on the electrical parameters of the Faraday-type MHD generator are considered. As gas properties are varying in the y direction, strong Hall currents are flowing in the x direction. These currents deteriorate the electrical performance of the generator; the A parameter which characterizes this deterioration is determined. The decrease of electrical terminal values may be strong especially in the case when the magnetic induction is high. The parameter A is proportional to B^{-2} and depends on the distribution functions of the gas conductivity and of the Hall parameter. The distributions of the electrical parameters in the y direction (current density, electrical potential, electrical field) become more non-uniform with the increasing of B. A constant channel cross section, no-leakage currents in the walls, a constant magnetic field, as well as constant electrical and gasdynamical parameters along the channel are assumed. It is also assumed that the distributions of the gas parameters are independent of the load factor. A numerical example is calculated. Author (NSA)

N70-34134* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ENERGY CONVERSION APPARATUS Patent

James E. Hatch, inventor (to NASA) Issued 24 Aug. 1965 (filed 8 Nov. 1961) 4 p Cl. 310-4

(NASA-Case-XLE-00212; US-Patent-3,202,844;

US-Patent-Appl-SN-151598) Avail: US Patent Office CSCL 10B

A device is described for direct conversion of thermal energy into electrical energy, using crossed electrical and magnetic fields. Conversion is accomplished by heating an electron-emissive plate contained in a spaced relationship to an electron collector plate. Electrons removed from the electron-emissive plate by heating are accelerated towards an accelerator grid by an electric field established between the plates and grid. A shaped magnet provides a unidirectional nonuniform magnetic field at right angles to the electric field causing the electrons to follow noncolliding circular paths between the electron-emissive plate and the collector plate. R.B.

N70-34959# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MAGNETOHYDRODYNAMIC METHOD OF OBTAINING ELECTRICAL ENERGY

05 ENERGY CONVERSION

I. Ya. Shipuk et al 30 Mar. 1970 61 p refs Transl. into ENGLISH from the Russian

(AD-705748; FTD-MT-24-445-69) Avail: CFSTI CSCL 10/2

Contents: Ionization instability in the disk channel of an unbalanced MHD generator: On the approximate solution of equations of the boundary layer on walls of an MHD generator; and Variational problems of magnetohydrodynamics. TAB

N70-36136# Committee on Interior and Insular Affairs (U.S. Senate).

MAGNETOHYDRODYNAMICS (MHD): POLLUTION-FREE PRODUCTION OF ELECTRICAL ENERGY FROM LOW-GRADE COAL, PART 2

Washington GPO 1970 120 p refs Hearing before Comm. on Interior and Insular Affairs, 91st Congr., 2d Sess., 23 Feb. 1970
Avail: Subcomm. on Minerals, Mater., and Fuels

N70-36137# Committee on Interior and Insular Affairs (U.S. Senate).

MAGNETOHYDRODYNAMICS (MHD): POLLUTION-FREE PRODUCTION OF ELECTRICAL ENERGY FROM LOW-GRADE COAL

Washington GPO 1970 122 p refs Hearing before Comm. on Interior and Insular Affairs, 91st Congr., 1st Sess., 18 Dec. 1969

Avail: Subcomm. on Minerals, Mater., and Fuels

Congressional hearings are reported on development of magnetohydrodynamic (MHD) generators as future sources of power. The use of MHD generators for production of electrical energy is described as almost pollution-free, requiring small quantities of water without thermally polluting the waters used in the process. The process can also utilize low-grade coal as the basic raw material, thus permitting exploitation of coal resources which are not economically feasible in conventional steam generating plants. See also N70-36136. R.B.

N70-36408# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INTERNATIONAL SYMPOSIUM ON MAGNETOHYDRODYNAMIC ELECTRICAL POWER

N. M. Maslennikov et al 22 Sep. 1969 31 p refs Transl. into ENGLISH from the Russian

(AD-703158; FTD-MT-24-150-69) Avail: CFSTI CSCL 10/2

Contents: Experimental investigation of electrical conductivity of a plasma on a model MHD generator; Spectroscopic investigation of an argon-caesium plasma. TAB

N70-36803* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. TWO-FLUID MAGNETOHYDRODYNAMIC SYSTEM AND METHOD FOR THERMAL-ELECTRIC POWER CONVERSION Patent

David G. Elliott, inventor (to NASA) Issued 24 Nov. 1964 (Filed 25 Jul. 1962) 8 p Cl. 310-11 Sponsored by NASA
(NASA-Case-XNP-00644; US-Patent-3,158,764;

US-Patent-Appl-SN-212496) Avail: US Patent Office CSCL 10B

A gas driven jet pump is used to provide high velocity flow of a liquid metal through a magnetic field to generate electrical energy. The liquid metal and gas mixture expands through a nozzle where the liquid metal is immediately separated from the gas and forced to flow as a thin film between two pole pieces, which establishes current flow through the liquid. R.B.

N70-36860*# Gulton Industries, Inc., Hawthorne, Calif. Engineered Magnetics Div.

DC POWER SUPPLY ENGINEERED MAGNETICS MODEL EMPS-252 FOR BRAYTON CYCLE POWER CONVERSION SYSTEM Final Report

M. Kruse 27 Aug. 1970 152 p

(Contract NAS3-10936)

(NASA-CR-72529; FR-2390) Avail: CFSTI CSCL 10B

The Brayton dc power supply converts 1200 Hz ac power to positive 28 volt and negative 28 volt dc power for use in the Brayton Space Power System. This supply also includes a positive and a negative 28 volt battery with chargers and control logic that directly supplies dc output power when ac input power is not available for conversion. The measured ac to dc conversion efficiency is 93%. The calculated mean time between failures is approximately 60,000 hours. The theory of operation, electrical and mechanical design drawings, reliability calculations, parts selections, thermal measurements, and test results are presented. Author

N70-37070*# Scientific Translation Service, Santa Barbara, Calif. DEVELOPMENT OF INSTALLATIONS FOR DIRECT CONVERSION OF HEAT INTO ELECTRICAL ENERGY BY MEANS OF MHD GENERATORS AND OTHER NEW ENERGY DEVICES

In its The Inst. of High Temp. of the USSR Acad. of Sci. The Most Important Results of Sci. Res. in 1969 Aug. 1970 p 45-83 refs

Avail: CFSTI CSCL 10A

Research connected with the development of stationary electrical power plants is reported and includes the following: (1) Investigations were conducted on metallic electrodes of steel and copper and also on ceramic electrodes of silicon carbide and zirconium dioxide. (2) Experimental equipment was built for studying the dynamics of processes adjacent to electrodes and permitting electro-optical detection of spots with time resolutions down to 10 to the minus 8th power sec with simultaneous measurement of charged particle concentration in the cathode region with time resolutions as low as 5 x 10 to the minus 8th power sec. (3) Investigation of the high-current discharge on electrodes covered directly with an additive in the MHD generator channel demonstrated that the intensity of the electrode disintegration process by pinched discharge is reduced by a factor of ten. (4) Thermal efficiency studies were made of the combined open cycle MHD power plants with various methods of achieving the high temperatures of the combustion products. (5) Theoretical and experimental studies of problems connected with the development of liquid metal MHD power plants were conducted. D.L.G.

N70-37638# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MHD METHODS OF OBTAINING ELECTRICAL ENERGY: ANNOTATION AND PREFACE

V. A. Kirillin et al 2 Apr. 1970 11 p Transl. into ENGLISH from the Russian

(AD-706160; FTD-MT-24-294-69) Avail: CFSTI CSCL 10/2

The document is comprised of an annotation and preface to a book which is a collection of articles which present results of scientific research on MHD generators in 1966-1967 at leading USSR organizations. The collection contains a description of research results on the first USSR experimental power installation with the U-02 MHD generator; technical economic analysis of future promising power plants with MHD generators; results of research in physics of plasmas and MHD as applied to problems of MHD generators; and results of work on liquid-metal MHD installations. Author (TAB)

N70-37652# Sundstrand Aviation-Rockford, Ill.
ORGANIC RANKINE CYCLE TECHNOLOGY PROGRAM
 Quarterly Progress Report, 1 Jul. 1969 - 1 Jan. 1970
 R. E. Niggemann 15 Mar. 1970 43 p ref
 (Contract AT(04-3)-651)
 (SAN-651-1186; QPR-14) Avail: CFSTI

The technology necessary to develop an organic Rankine cycle power conversion system capable of long duration operation in a space environment is investigated. The various studies include the working fluid, the bearings, the condensate pump, and the boilers. The performance of the Sunstrand 6 kwe organic Rankine cycle power system was also evaluated. R.B.

N70-37715# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ON THE PROBLEM OF CONSTRUCTING SUPERCONDUCTING MAGNETIC SYSTEMS FOR MHD-GENERATORS
 V. V. Sychev et al 22 Apr. 1970 31 p refs Transl. into ENGLISH from the Russian
 (AD-706779; FTD-HT-24-356-69) Avail: CFSTI CSCL 10/2

The direction towards which research and development in superconducting systems is going is reviewed. Nb-Ti alloys are found to dominate development of superconducting cables. The nature of field penetration in nonideal superconductors is shown to present a vexing problem. The actual design and construction of large scale superconducting systems is shown to be in its infancy. The concept of a magnetic pump for generating high currents in superconductors is emphasized. A detailed account is then given of the research going on in the High Temperature Institute. These include special flux linkage solenoid windings and an investigation in the induction of these superconducting solenoids. The detailed characteristics of three 65BY alloy superconducting solenoids are listed with solenoid constants of 0.78, 2.25, and 0.71 kilo-oersteds/amp. A figure compares the experimental and theoretical flux linkage curves of the three solenoids as a function of the nondimensional excitation current. Careful measurements are made of the static and dynamic inductance of each solenoid. The results show the connection between the inductance and the current during the first excitation, without prior history; the relationship between the inductance and the current during the solenoid discharge. Author (TAB)

N70-38631# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MAGNETOHYDRODYNAMICS IN MARINE ENGINEERING
 L. G. Vasilev et al 20 Feb. 1970 233 p refs Transl. into ENGLISH from the Russian
 (AD-706643; FTD-HT-23-237-69) Avail: CFSTI CSCL 13/10

Contents: The development and current state of magnetohydrodynamics; Magnetohydrodynamic effects; Magnetohydrodynamic meters; Electromagnetic pumps; Magnetohydrodynamic ship propulsion; and Magnetohydrodynamic power units for moving craft use. TAB

N70-38825# Atomic Energy Commission, Washington, D.C. Div. of Technical Information.
PULSED THERMONUCLEAR REACTOR OPERATED WITH LASERS [MIT LASERN BETRIEBENER GEPULSTER THERMONUKLEARER REAKTOR]
 Wolfgang Kaiser et al 7 Jan. 1969 12 p Transl. into ENGLISH from German Patent Appl. no. 1900524, 7 Jan. 1969, 12 p (AEC-tr-7148) Avail: CFSTI

A reactor employing LiD or LiT fuels, using a high power laser beam for excitation, is described. The advantages of the system are discussed. NSA

N70-38141# California Univ., Livermore. Lawrence Radiation Lab.
FUSION POWER: DIRECT CONVERSION AND THE REDUCTION OF WASTE HEAT
 R. F. Post [1970] 16 p
 (TID-25414) Avail: NTIS

Fusion reactors are discussed in the context of the direct conversion of fusion energy to electricity. The use of particles released from fusion reactors for the purpose of direct conversion is discussed. The use of different fuels and different conversion cycles is also discussed. NSA

N70-39278*# National Aeronautics and Space Administration, Washington, D.C.
HIGH-POWER, LONG-LIFE ELECTRICAL GENERATING SYSTEMS FOR LUNAR BASE MISSIONS
 Paul R. Miller In its Proc. of the 7th Ann. Working Group on Extraterrest. Resources 1970 p 11-21 refs
 22-30)
 Avail: SOD \$1.50; NTIS CSCL 10B

Nuclear and solar cell systems are potential power system candidates. An updated comparison of the primary performance characteristics of these two system types is presented. The effects of possible lunar base mission constraints and requirements identified from previous studies on these characteristics are then reviewed. Author

N70-40031# General Electric Co., Philadelphia, Pa.
OPTIMIZATION OF A LINEAR NON-EQUILIBRIUM MHD GENERATOR
 B. Zauderer Jun. 1970 22 p refs Its ONR Tech. Rept. No. 15
 (Contract Nonr-3867(00))
 (AD-707803; DOC-70SD281) Avail: NTIS CSCL 10/2

Based on the results of an experimental study of a supersonic, non-equilibrium MHD generator, a theoretical optimization of such a generator was performed. It was found that neon seeded with less than 0.1% cesium was the optimum generator working fluid. The maximum generator power output and efficiency was obtained in a constant current density generator operating with a favorable pressure gradient. The optimum channel geometry had an exit to entrance area ratio of about six, linearly diverging channel walls, and a length to average diameter ratio of about ten. It was also shown that a constant velocity generator with a linearly diverging channel geometry had a very low generator conversion efficiency. Author (TAB)

N70-40874*# National Aeronautics and Space Administration, Manned Spacecraft Center, Houston, Tex.
FUEL CELL TECHNOLOGY PROGRAM
 David Bell In its Space Transportation System Technol. Symp., Vol. 6 Jul. 1970 p 349-360
 Avail: NTIS CSCL 10B

The advanced fuel cell program to support the primary electrical power requirements of space shuttle vehicles in the mid-1970's is discussed. The objective is to advance the technology of hydrogen-oxygen fuel cells through a rigorous and comprehensive program commencing at the lowest component and material level and progressing through the fabrication and test of an engineering model fuel cell and related components and assemblies. Author

N70-42202*# TRW Equipment Labs., Cleveland, Ohio. Power Systems Dept.
BRAYTON CYCLE CAVITY RECEIVER DESIGN STUDY
 22 Nov. 1965 325 p refs

05 ENERGY CONVERSION

(Contract NAS3-2779)

(NASA-CR-54752) Avail: NTIS CSCL 10B

Studies leading to the design and development of solar dynamic power conversion systems which operate on the Brayton cycle are discussed. A design study of cavity-type receivers which employ lithium fluoride as the heat storage medium was conducted. Design and analysis of full scale flightweight receivers, conduction of a series of small scale experiments, and an experimental corrosion properties investigation on selected materials were completed. The results of the full scale design studies and of the small scale experiments are presented. Author

N70-42733* Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.

CASCADED THERMOELECTRIC TEST GENERATOR Final Report

25 Sep. 1970 102 p Prepared for JPL

(Contracts NAS7-100; JPL-952196)

(NASA-CR-110877; WANL-PR-(DDD)-006) Avail: NTIS CSCL 20C

A two-stage cascaded thermoelectric test generator was designed and fabricated. The design is based on state-of-the-art thermoelectric technology and represents an integration of three proven engineering devices into a compact space power supply test system. The generator consists of a high temperature silicon germanium stage which is thermally coupled to a lead telluride tubular module stage by a sodium heat pipe. A high temperature tantalum electrical heater was designed to thermally simulate a radioisotope heat source. The generator, heat source, and a calorimetric heat sink, were assembled within a vacuum chamber. The design efficiency goal for the cascaded unit is a minimum of seven percent. It is anticipated that the test assembly will demonstrate an overall efficiency of at least 8.8 percent and generate 213 watts of electrical power at reference operating conditions. Author

N70-42951* Naval Ship Engineering Center, Washington, D.C. Propulsion Systems Analysis Branch.

THE 7TH ANNUAL TECHNICAL SYMPOSIUM: A CLOSED BRAYTON CYCLE POWER PLANT FOR UNDERWATER APPLICATIONS AND COMPARISON WITH A FUEL CELL

Harry Balukjian 1970 93 p refs

(AD-709387) Avail: NTIS CSCL 10/2

A 50 KW thermochemical power plant for underwater applications featuring a closed Brayton cycle power loop is described. A typical application to a deep operating submersible is examined and comparisons made with a fuel cell power source. Systems are studied for two depths (8,000 and 20,000 feet) and for three endurance (20, 40 and 120 hours). The analysis of a closed Brayton cycle includes a comparison using several different circulating gases in the loop such as Krypton, Argon and Xe - He. To make this analysis a computer program was developed in which values of enthalpy were obtained by multiplying the specific heat at constant pressure by temperature rather than using gas tables. Calculations are shown for a single fuel cell including the reversible emf and the ideal comparative thermal efficiency. Estimates are also given for the overall comparative efficiency of an actual fuel cell system. Pressure vessels needed to encapsulate the power conversion module and the two reactants account for approximately one half of the total system weight at neutral buoyancy. Calculations are shown for finding the specific fuel and oxidant consumption. This is needed to size the pressure vessels as well as to add to the weight and volume inventory. Author (TAB)

N71-10992* General Electric Co., Philadelphia, Pa. Missile and Space Div.

INVESTIGATION OF A LARGE SCALE NONEQUILIBRIUM

MAGNETOHYDRODYNAMIC GENERATOR Annual Report, 1 Aug. 1969 - 31 Jul. 1970

B. Zauderer 31 Jul. 1970 15 p refs

(Contract Nonr-3867(00))

(AD-711351) Avail: NTIS CSCL 10/2

A large portion of the effort of the present contract year was devoted to technology problems, namely, the development of a satisfactory cesium seeding technique, the development of the thermionically emitting electrodes compatible with the shock tube MHD generator, the design of a large MHD magnet, the design of a new MHD channel, and the development of additional diagnostic techniques. A considerable number of MHD experiments with cesium seeded, noble gases were performed. An analytical study of power optimization in linear MHD generators was undertaken. A study of the effect of molecular gases on the generator performance was undertaken. TAB

N71-11062 Oklahoma Univ., Norman.

CONCEPTUAL DESIGN OF A FIVE KW RADIOISOTOPE-FUELED POWER SYSTEM FOR TERRESTRIAL APPLICATIONS

Floyd Olan Calvert (Ph.D. Thesis) 1969 167 p

Avail: Univ. Microfilms: HC \$7.80/Microfilm \$3.00 Order No. 69-21979

The conceptual design study initially examines various possible dynamic power conversion systems including Brayton, Rankine, Stirling, and Feher power cycles. The direct Rankine cycle is selected for the design study on the basis of the pertinent criteria. Next considered are various possible working fluids for the power cycle. Steam and mercury are determined to be the best working fluids and power cycles are compared using these two fluids. Even though liquid metals are handicapped in terrestrial applications due to high condensing temperatures, it is shown that the liquid mercury cycle may be expected to have as high (or higher) a cycle efficiency as the steam cycle. This is due to the fact that the adiabatic expansion efficiency of the mercury turbine is greater than that for the small steam turbine. The radioisotope heat source subsystem design is considered in some detail and a particular cylindrical geometric arrangement using tungsten metal in the dual role of radiation shield and thermal conductor is recommended. Dissert. Abstr.

N71-11689* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SURVEY OF MATERIALS FOR THERMIONIC CONVERTERS

Arthur L. Smith Washington Nov. 1970 54 p refs

(NASA-TM-X-2130; E-5789) Avail: NTIS CSCL 11F

The survey is intended for the use of people unfamiliar with the field. The effect of material selection and characteristics on the electrode properties is emphasized. The following areas are explored: (1) materials requirements, (2) identification of materials most likely to meet these requirements, (3) relevant physical and mechanical properties of these materials, and (4) proposals for modifying these materials for improved systems performances. Author

N71-12372* Georgia Inst. of Tech., Atlanta.

AFOSR CONTRACTORS' 11th MEETING ON KINETICS OF ENERGY CONVERSION: ABSTRACTS OF PAPERS

1970 42 p refs Conf. held at Atlanta, 3-4 Sep. 1970

(Grant AF-AFOSR-1308-67)

(AD-712738; AFOSR-70-2232TR) Avail: NTIS CSCL 7/4

The report consists of the agenda and abstracts of papers presented at the Eleventh Annual Contractors Meeting on Kinetics of Energy Conversion. The abstracts describe work now in progress under the sponsorship of the Energetics Division, Directorate of Aeromechanics and Energetics, AFOSR. Subjects discussed in the

papers included the following: hydrogen-oxygen reactions, fluorine reactions, reactions in flames, atomic and molecular beam studies, combustion kinetics, matrix isolation studies, propellant sensitivity, vibrational and electronic relaxation, and lifetimes of metastable species. Author (TAB)

N71-13249 Lockheed Missiles and Space Co., Palo Alto, Calif.
ON THE THERMODYNAMICS OF SYSTEMS OF DIRECT CONVERSION OF THERMAL INTO ELECTRICAL ENERGY
 V. A. Grodtko et al [1970] 13 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. i Transp. (Moscow), no. 4, 1970 p 117-126
 Avail: National Translations Center, John Crerar Library, Chicago, Ill. 60616

Relations describing the general characteristics of a system performing direct conversion of thermal energy into electrical are derived by thermodynamic analysis. It is shown that in particular cases the relations result in the known equations for characteristics of thermoelectric and thermoemission converters, as well as in regularities underlying the operation of these apparatus, the relations which determine the thermoelectric phenomena, the Richardson equation, etc. A thermodynamic cycle is proposed whose quantitative characteristics are identical, under the assumptions customary for an ideal cycle, to the characteristics of a direct conversion system in both the general and particular cases. Author

N71-15010# Atomic Energy Commission, Washington, D.C.
MAGNETOPLASMA DYNAMIC (MPD) CONVERTERS [MAGNETOPLASMA DYNAMISCHE (MPD) WANDLER]
 W. Peschka et al Sep. 1970 72 p refs Transl. into ENGLISH from German report DLR-FB-69-85
 (AEC-tr-7161; DLR-FB-69-85) Avail: NTIS

Theoretical and experimental results on closed-cycle inductive MPD systems are given. Mercury vapor and argon are used as working fluids. Radiofrequency discharges were used for plasma generation. Cryopumping systems are used in the experimental setup with considerable success. Some ideas on the further development of the experimental work are given. Author (NSA)

N71-15039# Minnesota Mining and Mfg. Co., St. Paul, Minn. Electrical Products Group.
DEEP SEA RADIOISOTOPE-FUELED THERMOELECTRIC GENERATOR POWER SUPPLY SYSTEM. SNAP-21 PROGRAM, PHASE 2: 10-WATT SYSTEM Final Summary Report
 F. Fox, R. Pannemann, and R. Wickenberg, eds. May 1970 389 p
 (Contract AT(30-1)-3691)
 (MMM-3691-62) Avail: NTIS

The SNAP-21 system is a radioisotope-fueled thermoelectric generator designed for deep sea applications. It functions by converting the heat from a decaying radioisotope fuel into useful electric energy. This heat energy is converted into electric energy by a thermoelectric generator. The isotopic fuel supplies heat to the thermoelectric materials and sea water acts as the heat sink to maintain the temperature gradient. Other components are employed to increase efficiency and condition the electric output to the desired form. The components performing these functions are enclosed in a pressure vessel which protects them from sea water pressure and exposure. No external inputs are required to maintain operation of the system. With this type of mechanically-static, unsupported operation, long life with no maintenance is achieved. Data and descriptions are presented on components of SNAP-21 including the heat source, shielding, insulation, thermoelectric generator, power conditioner, pressure vessel, electric receptacle, and generator mounting. Author (NSA)

N71-15242# California Univ., Livermore. Lawrence Radiation Lab.

SOME ECONOMIC ASPECTS OF POWER CONVERSION FOR FUSION REACTORS

P. B. Mohr 15 Sept. 1970 8 p refs Presented at the 'Energy 70' IECEC Conf., Las Vegas, Nev., 21-25 Sep. 1970 Sponsored by AEC

(UCRL-72349; Conf-700912-3) Avail: NTIS

It is considered how increased conversion efficiency made possible by advances in materials, direct conversion and thermodynamic technology may be utilized to offset both fixed and variable costs. Thermonuclear reactors produce power in the form of both neutral and energetic charged particles. Using present power costs as a base, one finds thermodynamic conversion of the energy of neutral particles to be adequate to support internal power requirements as great as 25% of the fusion power, providing capital cost per marketable kilowatt for the entire system is not more than one and one-half to two times that of current fossil fuel systems. On the same basis, the direct conversion of energetic charged particles at high (> 90%) efficiency would allow circulation of internal power approaching the same order as the fusion power. For lesser internal power requirements, high injection and recovery efficiency would allow normalized capital costs from two to three times present values, or, alternatively, power costs could be substantially reduced. Author (NSA)

N71-15562* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

CROSSED-FIELD MHD PLASMA GENERATOR/ACCELERATOR Patent

Alexander P. Sabol, inventor (to NASA) Issued 20 Oct. 1970 (Filed 24 Jan. 1969) 7 p Cl. 315-111; Int. Cl. H01j1/50; Int. Cl. H05j1/00

(NASA-Case-XLA-03374; US-Patent-3,535,586;

US-Patent-Appl-SN-793770) Avail: US Patent Office CSCL 201

A plasma generator and accelerator is described in which electrode pairs are mounted in a closed channel and a constant magnetic field is applied across the channel. The sides of the rectangular shaped channel parallel to the electrode pairs forms an idler (electrically floating) electrode. A working gas is introduced at one end of the channel. In operation, a main arc, supplied by a continuous power source, is created across the electrode pairs adjacent to the point of gas introduction. As it is being acted on by MHD forces, the main arc moves to the next electrode pair, and so on downstream. Each time a main arc moves to the next electrodes, side arcs are formed between each of the two electrodes of the prior electrode pair and the idler electrode. The side arcs move upstream in the outer sections of the channel and reconnect the electrode pair to form more main arcs. The reconnected main arcs then move downstream because of being acted on by MHD forces. Due to an electrical shorting action, the main arcs extinguish at the last electrode pair. The action of the main arcs accelerates plasma which is omitted from the channel.

Official Gazette of the U.S. Patent Office

N71-15723# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Abt. Magnetofluidynamische Energiewandlung.

THE FUEL CELL CONCEPT. A REVIEW OF BASIC PRINCIPLES

Richard James Henry Jul. 1970 25 p refs (DLR-MITT-70-09) Avail: NTIS; ZLDI Munich: 7.60 DM

The discussion of single cell electrochemistry includes performance characteristics of the Apollo fuel cell using hydrogen-oxygen reactants. Modern applications of cells using air oxidant and hydrocarbon fuels are described and the relatively pollutant-free fuel cell exhaust is compared with that from commercial powerplants. Author (ESRO)

05 ENERGY CONVERSION

N71-15736# California Univ., Livermore. Lawrence Radiation Lab.

DIRECT CONVERSION OF FUSION ENERGY TO ELECTRICITY

R. F. Post 14 Sep. 1970 11 p refs Presented at the Intersociety Energy Eng. Conf., Las Vegas, Nev., 21-25 Sep. 1970 Submitted for publication Sponsored by AEC (UCRL-72411; CONF-700915-5) Avail: NTIS

Plasma ions and electrons diffusing out of the confinement zone carry not only kinetic energy imparted by the injection and heating processes employed but also energy derived from the fusion reactions. A method is described for the direct conversion to HVDC, at high efficiency, of energy from charged particle streams emerging from the fusion reactions. The method involves four steps: 1) expansion in static magnetic fields to convert rotational energy components to longitudinal and to reduce the particle stream density; 2) separation of ions and electrons; 3) electrostatic deceleration and selective collection of the separated particle stream to produce dc currents; and 4) reduction of recovered energy to common dc potential for use as HVDC. Theoretical analyses of the overall characteristics of such a system indicate high overall conversion efficiency (90% or greater) and potentially low capital cost per kWe. The possible application of such systems to mirror machines and other types of fusion reactors is discussed, as well as some results from small-scale experiments testing the principles involved. Author (NSA)

N71-16314# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THERMODYNAMIC ASPECTS OF THE PROBLEM OF IMMEDIATE CONVERSION OF CHEMICAL ENERGY INTO ELECTRICAL

N. S. Lidorenko et al 21 Aug. 1970 21 p Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. i Transp. (Moscow), no. 6, 1969 p 93-101

(AD-713875; FTD-MT-24-114-70) Avail: NTIS CSCL 7/4

The basic aspects of the thermodynamic description of an electrochemical generator were examined. By the thermodynamic methods of balanced processes basic expressions for emf and efficiency of the generator were obtained. The effect of the basic parameters of the working body on generator characteristics were analyzed, and the expressions for optimum temperature, corresponding to maximum efficiency or emf have been found. On the basis of the obtained expressions, the characteristics of the electrochemical generator on a series of possible working bodies were analyzed. The system of equations which described the unbalanced processes in an electrochemical generator were examined. For the generator with an ion-exchange diaphragm on the basis of the accepted model a method of calculating the volt-ampere characteristic is presented. Author (GRA)

N71-17840# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

THEORETICAL ANALYSIS OF AN INDUCTIVE, CYLINDRICAL MHD CONVERTER WITH CRYOGENICALLY COOLED WINDINGS [UEBER DIE THEORIE DES INDUKTIVEN ZYLINDERSYMMETRISCHEN MHD-WANDLERS MIT KRYOGEN GEKUEHLTER WICKLUNG]

Andreas Gann Jun. 1970 65 p refs In GERMAN; ENGLISH summary

(DLR-FB-70-25) Avail: NTIS; ZLDI Munich: 17,20 DM

Two dimensional calculations for an infinite length cylindrical converter with a liquid metal incompressible medium and constant channel flow velocity are presented. The effects of eddy-currents

induced in the outer channel wall and of the liquid metal viscosity were included. A computer program was developed to evaluate the converter performance. Author (ESRO)

N71-17933# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRANSFER FUNCTION DETERMINATION OF THE PRIMARY LOOP OF A CONCEPTUAL NUCLEAR BRAYTON SPACE POWERPLANT

Edward J. Petrik and Arthur W. Kieffer Washington Mar. 1971 45 p refs

(NASA-TM-X-2193; E-5830) Avail: NTIS CSCL 18E

The primary loop of a conceptual nuclear Brayton space powerplant was described by a set of nonlinear differential equations. The equations were simplified and linearized. A phase variable technique was used to determine the transfer functions for small step input disturbances in each of the following: (1) reactivity, (2) lithium flow rate in primary loop, and (3) argon flow rate in power conversion loop. The time response obtained from the transfer functions for the three input disturbances agrees with the time response obtained from the original nonlinear differential equations. Author

N71-18866# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

OPERATING CHARACTERISTICS OF THE PRIMARY FLOW LOOP OF A CONCEPTUAL NUCLEAR BRAYTON SPACE POWERPLANT

George E. Turney, Arthur W. Kieffer, and Edward J. Petrik Washington Mar. 1971 37 p refs

(NASA-TM-X-2161) Avail: NTIS CSCL 18L

An analytical study was made of the steady-state and transient operating characteristics of the lithium cooled primary flow loop of a conceptual nuclear Brayton space powerplant. From the system investigation, it was determined that (1) the steady-state power of the reactor varies linearly with (a) the inserted reactivity and (b) the flow rate of inert gas in the Brayton power conversion loop (2) the flow rate of lithium in the primary loop has a small effect on the reactor steady-state power. The transient changes in the reactor power and temperature of the primary loop were determined for step input disturbances in (1) inserted reactivity, (2) lithium flow rate in the primary loop, and (3) inert-gas flow rate in the Brayton power conversion loop. The response of the system to these step changes can be characterized as stable and highly damped Author

N71-21693* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SELF-REPEATING PLASMA GENERATOR HAVING COMMUNICATING ANNULAR AND LINEAR ARC DISCHARGE PASSAGES Patent

Alexander P. Sabol, inventor (to NASA) Issued 25 Jul. 1967 (Filed 24 Feb. 1966) 7 p Cl. 315-111

(NASA-Case-XLA-03103; US-Patent-3,333,152;

US-Patent-Appl-SN-531642) Avail: US Patent Office CSCL 20I

A self repeating plasma generator having an annular channel and a linear channel is reported. The linear channel is tangent to the annular channel and is in communication with the annular channel. Electric fields are created in both channels, a magnetic field is created in both channels perpendicular to the electric fields and to the longitudinal dimension of the linear channel, and a gas is pumped into the channels. When an arc is initiated in the annular channel, it is pulled along the channel until it reaches the linear channel where the arc divides into two arcs. One arc proceeds down the linear channel accelerating the gas in front of it, and the other arc proceeds around the annular channel. Hence, an arc will be initiated and then proceed down the linear channel and accelerate the gas in front of it each time the arc in the annular channel makes a revolution. Official Gazette of the U.S. Patent Office

N71-22560* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Propulsion Div.

LIQUID METAL MHD POWER CONVERSION

D. J. Cerini *In its JPL Quarterly Tech. Rev.*, Vol. 1, No. 1 Apr. 1971 p 64-67 ref (See N71-22551 11-30)

Copyright. Avail: NTIS HC\$6.00/MF\$0.95 CSCL 201

A liquid metal magnetohydrodynamic power converter has been successfully operated with the generation of ac electrical power. Gaseous nitrogen is used to produce the closed cycle flow of the liquid metal (NaK) working fluid through the MHD generator where the fluid kinetic energy is converted to electrical energy. The operational characteristics of the converter are given and the results of the current series of tests are discussed. Author

N71-24578* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

THE POTENTIAL OF NUCLEAR MHD ELECTRIC POWER SYSTEMS

G. R. Seikel and L. D. Nichols 1971 12 p refs Proposed for presentation at AIAA 7th Propulsion Joint Specialist Conf., Salt Lake City, 14-18 Jun. 1971

(NASA-TM-X-67829; E-6304) Avail: NTIS CSCL 18L

The performance of the turbo-MHD cycle is compared with the equivalent Brayton-MHD and Brayton-turboelectric cycles. For the MHD cycles, a top temperature of 2500 K is assumed and two working fluids are considered. For the cycles with turbines, two turbine inlet temperatures are considered: 1500 and 1250K. The cycle temperatures, efficiencies, and specific radiator areas are compared for these various space power systems. The efficiency of the turbo-MHD system is also presented for ground power plants. The specific masses of man shielded 10 MW electric space power systems are estimated. A brief discussion is then presented of the technology of the two most critical components of such an MHD systems. Included in this discussion is a possible modification of the turbo-MHD cycle to minimize the problems associated with alkali-metal-seeded generators and reactor fission product release.

Author

N71-24680# General Electric Co., Philadelphia, Pa. Space Div. **EXPERIMENTS IN A LARGE, NON-EQUILIBRIUM MHD GENERATOR WITH CESIUM SEEDED, NOBLE GASES AND HEATED ELECTRODES**

B. Zauderer and E. Tate Feb. 1971 19 p refs
(Contracts N00014-70-C-0321; Nonr-3867(00))
(AD-719381; TR-17) Avail: NTIS CSCL 10/2

An experimental study was performed of the operating characteristics of a linear, supersonic Faraday generator, having heated wire electrodes suspended in the gas flow. The test gases were argon, neon, helium seeded with 0.8% cesium. It was observed that locating the electrode outside the cold boundary layer greatly reduced the current ignition voltage at the electrodes below that obtained previously with flush mounted electrodes. However, heating the electrodes to 1600K temperatures produced no significant improvement in the electrode performance over that obtained with room temperature electrodes at current densities of about 10 amp/sq/cm. In both cases, the electrode conduction was through arc spots with cathode losses of about 60V.

Author (GRA)

N71-26190# Avco-Everett Research Lab., Everett, Mass.

RESEARCH ON MFD ENERGY CONVERSION Final Report

James E. Klepeis and Jean F. Louis Wright-Patterson AFB, Ohio ARL Nov. 1970 97 p refs

(Contract F33615-69-C-1450)
(AD-720257; ARL-70-0244) Avail: NTIS CSCL 10/2

In noble gases, the elevation of the electron temperature by Joule heating has been clearly demonstrated, but it has also been well established that this nonequilibrium is associated with

an ionization instability. The latter leads to electron density nonuniformities and results in a change of the bulk plasma properties. MHD generators driven by molecular or combustion gases and operating at high Hall coefficients are not, a priori, immune from similar instabilities occurring either locally (over the insulators) or in the bulk of the plasma. The purpose of the present study was to determine the bulk properties of the plasma at high Hall coefficients in various molecular gases. The facility used was a disk generator driven by a shock tube. Author (GRA)

N71-26449 Brown Univ., Providence, R.I.

AN ANALYSIS AND DESIGN STUDY OF THE COMPRESSIBLE, TRAVELING WAVE, MAGNETOHYDRODYNAMIC, INDUCTION GENERATOR

Richard Carl Lessmann (Ph.D. Thesis) 1969 161 p

Avail: Univ. Microfilms Order No. 70-8751

The generator is composed of an annular flow passage arranged coaxially with a set of field coils. Interaction between the traveling-wave magnetic field and the moving fluid induces ring currents, in the flow gap, which inductively couple to the field coils. The analysis is based on a set of fundamental equations which neglect the effects of viscosity and heat conduction but admit arbitrary thermal and caloric equations of state. The results are used to investigate the procedure of end coil matching and several electrical characteristics of the generator including: impedance, generated power, and conversion efficiency. The time-averaged flow problem is solved for several different design cases and non-dimensional plots of the results are included. Based on an approximation to the stability criterion it is shown that while no region of parameter space is absolutely stable, maximum stability, for all disturbance frequencies, is obtained when the square of the ratio of the mean Alfvén speed to the speed of sound is small.

Dissert. Abstr.

N71-26458# Joint Publications Research Service, Washington, D.C.

WORK ON MAGNETOHYDRODYNAMICS (SYMPOSIUM IN THE USA)

V. V. Prokudin *In its Vestn. of the USSR Acad. of Sci.*, Vol. 40, No. 6, 1970 31 Aug. 1970 p 127-132 refs

14-30)

Avail: NTIS
Engineering aspects of magnetohydrodynamics are described in brief abstracts of a number of studies. Considered are cyclic magnetohydrodynamic generators working on combustion products, plasma diagnostics and the investigation of discharge electrodes, designs of installations and closed-cycle generators, and channel flow and phenomena of instability. G.G.

N71-27207# Institute of Nuclear Research, Warsaw (Poland).

NUMERICAL CALCULATIONS OF THE ELECTRICAL PARAMETERS IN A FARADAY-TYPE MHD GENERATOR WITH TWO-DIMENSIONAL GAS FLOW

Z. Celinski 1970 34 p refs

(INR-1199) Avail: AEC Depository Libraries

The two-dimensional electrical network was assumed as a model of the two-dimensional gas flow in MHD channels. Applying the calculated velocity and temperature profiles, the network was solved using the GIER computer. All electrical values, the terminal ones as well as local, were calculated. The constant channel cross section, the subsonic gas flow, and the uniform distribution of the gas parameters along the channel were assumed in the calculations. The distribution of the gas parameters was assumed to be independent of the generator loading. The channel end effects were neglected. Author

05 ENERGY CONVERSION

N71-27918# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

APPLIED MAGNETOHYDRODYNAMICS. ISSUE 6: PARAMETRIC STUDIES AND DIMENSIONING OF NOBLE GAS MHD GENERATORS [ANGEWANDTE MAGNETOHYDRODYNAMIK. HEFT 6: PARAMETRISCHE STUDIEN UND DIMENSIONIERUNG VON EDELGAS-MHD-GENERATOREN]

Th. Bohn, Chr. Holzapfel, and G. Kolb Oct. 1970 41 p refs In GERMAN; ENGLISH summary (JUL-706-TP) Avail: AEC Depository Libraries

Several parameters in connection with the total plant loop were considered in designing a MHD Generator for a nuclear MHD power plant. Thus, a limitation was established for the parameters in which it is possible to build the MHD generator without conflicting with the conditions of the other components of the power plant. The two working gases, argon and helium seeded with cesium, were numerically investigated, using a one dimensional theory. Considering friction losses, the upper limit was calculated for the pressure at which it is possible to gain enough power as a function of Mach number. Several examples of the calculated parameters in the generator are shown. Author (NSA)

N71-28680# Tennessee Univ., Tullahoma. Space Inst. **FLUCTUATIONS IN SERIES CONNECTED OPEN CYCLE MHD GENERATORS**

J. B. Dicks, Jr., Y. C. L. Wu, Mary Hall Scott, and E. M. Murray 2 Feb. 1971 15 p refs Presented at the 5th Intern. Conf. on Magnetohydrodynamic Elec. Power Generation, Munich, 19-23 Apr. 1971

(Contract F44620-69-C-0031)

(AD-721454; AFOSR-71-0843TR) Avail: NTIS CSCL 10/2

Fluctuations are present in MHD generators as stated previously in the literature. Attempts to relate these fluctuations to magnetoacoustical waves predicted by theory have not been successful. In this paper one describes another approach to fluctuation analysis. The theoretical and experimental methods used here are those of signal analysis involving functions such as probability density, cross-correlation, auto-correlations and power spectral density. It was found that the fluctuations in Hall voltage, electrode current, temperature, and pressure were all random Gaussian in nature. The probable source of the fluctuations was traced to turbulent fluctuations in the electric sheath properties and to conductivity fluctuations in the channel. Application of probability theory and function space analysis provides a new way of measuring the Hall parameter in the generator. Additional understanding on the operation of series connected generators is obtained through the observation that the fluctuations in the generator output are much lower than those that would be expected from adding the fluctuations of individual electrodes. This indicated that the generator must be studied as a whole in order to understand its behavior and that investigations involving a few electrodes are not sufficient to determine the overall generator performance. Author (GRA)

N71-28718# Tennessee Univ., Tullahoma. Space Inst. **FACTORS EFFECTING THE PERFORMANCE OF DIAGONAL CONDUCTING WALL OPEN CYCLE MHD GENERATORS**

Y. C. L. Wu, L. Crawford, R. Shanklin, J. Muehlhauser, and D. Molnar Feb. 1971 19 p refs Presented at Intern. Conf. on Magnetohydrodynamic Electrical Power Generation, 5th, Munich, 19-23 Apr. 1971

(Contract F44620-69-C-0031)

(AD-721455; AFOSR-71-0853TR) Avail: NTIS CSCL 10/2

A systematic study has been undertaken to attempt to evaluate gross factors effecting the overall performance of series connected generators. These factors include combustor performance, chemistry, magnetic field strength, Mach number, and electrode

segmentation. The scaling law for the magnetic field is of the form $(B - V \text{ sub } d/ud) \text{ squared}$. Dimensional scaling was investigated by varying the segmentation ratio of electrode length to channel height. The results show that when the electrode length divided by the channel height is changed from the neighborhood of .12 to the neighborhood of .25 then the generator power output decreases by 15 percent over the entire load spectrum. Other studies involving gross generator behavior include an investigation of the effect resulting from the deposit of aluminum oxide and other combustion materials on the walls of the generator. No deterioration of performance was noted during this process. The addition of the powdered aluminum improved the generator performance. During the course of the experimental study, it was found that both the injector head and combustor are very critical to the performance of the generators. Author (GRA)

N71-30458# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

APPLIED MAGNETOHYDRODYNAMICS. NUMBER 5: MHD-NUCLEAR POWER STATIONS [ANGEWANDTE MAGNETOHYDRODYNAMIK. HEFT 5: MHD-KERNKRAFTWERKE]

T. Bohn, K. Grawatsch, P. Komarek, and G. Noack Aug. 1970 231 p refs In GERMAN

(JUL-689-TP) Avail: AEC Depository Libraries

In an attempt to give a comprehensive representation of the developmental problems facing future magnetohydrodynamic nuclear power plants, an analysis was performed on a number of components. These included: the reactor, MHD generator, transformer, superconducting magnet, heat exchanger, seed material circuit, turbines, and high temperature transmission elements. Following parametric studies of possible design data, specifications could be placed on conventional components, and those requiring special developmental efforts could be identified. It appears that a sufficient technological basis exists for constructing the necessary turbines, heat exchanger, high temperature transmission elements, and electrical transformer. The MHD channel, superconducting magnet, and seed-material circuit need intensive development studies. Technological problems still open are the stability of large superconducting magnets at high magnetic field strengths and the seed material deposition. The biggest development problem lies in the area of high temperature reactors, since an increase in the gas outlet temperature to 2000 C assumes great improvements in coated-particle technology. Circuit optimization and cost studies indicate that the costs of the individual components, with the exception of the reactor, are already well known. Author (NSA)

N71-32212*# Translation Consultants, Ltd., Arlington, Va. **THE POSSIBILITY OF USING MICROWAVE IONIZATION TO OBTAIN NONEQUILIBRIUM PLASMA IN MHD GENERATORS [O VOZMOZHNOСТИ ISPOLZOVANIYA MIKROVOLNOVOY IONIZATSII DLYA POLUCHENIYA NERAVNOVESNOY PLAZMY V MGD-GENERATORAKH]**

Washington NASA Aug. 1971 11 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (Kiev), v. 16, no. 5, May 1971 p 705-710

(Contract NASw-2038)

(NASA-TT-F-13783) Avail: NTIS CSCL 20I

The possibility of creating high-conductivity, nonequilibrium plasma at low gas temperature is pointed out. The plasma can be used in MHD generators. Microwave plasma conductivity in excess of 100 mohms/m can be obtained in argon without alkali metal admixtures. Estimates are given for the efficiency of use of this preliminary ionizer in MHD devices. Data obtained are compared with experimental results using electron flow as the preliminary ionizer in MHD generators. Author

N71-33626*# Florida Univ., Gainesville. **RESEARCH ON URANIUM PLASMAS AND THEIR TECHNOLOGICAL APPLICATIONS**

Karlheinz Thom and Richard T. Schneider, eds. Washington NASA 1971 503 p refs Symp. held at Gainesville, Fla., 7-8 Jan. 1970 Sponsored by NASA

(NASA-SP-236) Avail: SOD \$3.75; NTIS CSCL 18E

Studies on uranium plasma physics and applications, especially in gaseous core reactors, are presented. The topics cover reactor concepts, plasma properties, nucleonics and radiation, nuclear light bulb engines, MHD power generation, nuclear lasers, and containment, flow, and stability. For individual titles, see N71-33627 through N71-33668.

N71-33632* Computer and Applied Sciences, Inc., Philadelphia, Pa.

GASEOUS FISSION CLOSED LOOP MHD GENERATOR

Arthur Sherman *In* Florida Univ. Res. on Uranium Plasmas and Their Technol. Appl. 1971 p 47-51 refs (See N71-33628 20-22)

Avail: SOD \$3.75; NTIS CSCL 18E

The question of achieving a very low specific weight for a nuclear electric space power plant in order that an electrical propulsion system could prove very attractive for space flight is considered. The study of a gaseous fission reactor operating at moderate temperatures in a closed-loop power plant with an MHD generator as the energy converter is suggested. Author

N71-33661* Avco-Everett Research Lab., Everett, Mass.

MHD POWER GENERATION: STATE OF THE ART AND PROSPECTS FOR ADVANCED NUCLEAR APPLICATIONS

Richard J. Rosa *In* Florida Univ. Res. on Uranium Plasmas and Their Technol. Appl. 1971 p 315-326 refs

Avail: SOD \$3.75; NTIS CSCL 18E

State-of-the-art developments in magnetohydrodynamic power generation are reviewed. Base load, emergency, and peaking power generation are included. Economic and environmental factors are considered in relation to MHD generator location. Applications of MHD generators in radiating power plants, propellant-cooled propulsion systems, and commercial industries are cited. J.M.

N71-33663* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THE PERFORMANCE OF HELIUM SEEDED WITH URANIUM IN A MAGNETOHYDRODYNAMIC GENERATOR

Allan R. Bishop *In* Florida Univ. Res. on Uranium Plasmas and Their Technol. Appl. 1971 p 335-341 refs

Avail: SOD \$3.75; NTIS CSCL 18E

The feasibility of using helium seeded with uranium as a working fluid in an MHD generator is discussed. Nonequilibrium ionization of the seed (uranium), including losses due to electrothermal instabilities, is examined over a range of stagnation temperatures (2000 to 4000 K), stagnation pressures (10 to 50 atm), and Mach numbers (0.5 to 1.5). The optimum mixture (for maximum power density) of helium and uranium is about 6 atoms of uranium/1,000 atoms of helium. The nonequilibrium conductivity, including instability losses, is higher than the equilibrium conductivity for the temperature range considered. The output power of a specific generator configuration is presented as a function of stagnation temperature. The helium-uranium mixture is a possible working fluid for MHD generators, although the power density is lower than those for more conventional working fluids. Author

N71-33664* Georgia Inst. of Tech., Atlanta.

GAS CORE REACTORS FOR MHD POWER SYSTEMS

J. R. Williams and S. V. Shelton *In* Florida Univ. Res. on Uranium

Plasmas and Their Technol. Appl. 1971 p 343-349 refs

Avail: SOD \$3.75; NTIS CSCL 18E

The MHD generator is examined as one energy conversion device that can extract energy from a working fluid at a very high temperature. Coupled with the gas-core reactor the problem of achieving high electrical conductivities is solved by providing an extremely hot working fluid, and eliminating the high specific impulse nuclear rocket propulsion. This combined concept, with its many advantages is submitted to meet the growing demand for power without thermal pollution. E.M.C.

N71-35233* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

ANALYSIS OF A 35- TO 150-KILOWATT BRAYTON POWER-CONVERSION MODULE FOR USE WITH AN ADVANCED NUCLEAR REACTOR

Paul T. Kerwin Washington Sep. 1971 28 p refs

(NASA-TN-D-6525; E-6352) Avail: NTIS CSCL 18N

Reference parameters were selected for a Brayton power-conversion module with a turbine inlet temperature of 1144 K (2060 R) to be used in a nuclear-reactor-powered system capable of producing up to 450 kilowatts, electric. Unshielded system specific weight is 90 lb/kWe with a specific radiator area of about (30 square feet per kWe) at full power. Author

N71-35623* Joint Publications Research Service, Washington, D.C.

ELECTRODE MATERIALS BASED ON SILICON CARBIDE FOR OPEN CYCLE MHD GENERATORS

G. M. Kafarova et al *In* its Mater. for MHD Generator Channel 31 Aug. 1971 p 20-28 refs

Avail: NTIS

The results of chemical, X-ray diffraction, electron microscopic and other analyses of ceramics based on silicon carbide after about 50 hours of operation in the channel of the U-02 installation are presented. The general laws of change of structure and properties of the material are established. Silicon carbide, alloyed with high-melting metals (Ti, Mo, Cr.) is used as the electrode material for long-term operation in the MHD generator channel up to an electrode surface temperature equal to 1,800 K. Author

N71-35627* Joint Publications Research Service, Washington, D.C.

OXIDE MATERIALS FOR HOT CHANNEL OF OPEN CYCLE MHD GENERATOR

A. B. Ivanov et al *In* its Mater. for MHD Generator Channel 31 Aug. 1971 p 48-58 refs

Avail: NTIS

Information about the properties of oxide electrode materials and the results of testing in experimental channel of open cycle MHD generator is presented. As a result of combined studies on the problem of materials for MHD power plants, the requirements on materials for individual components of MHD generators, the scope of promising materials and the principles for their use in fabrications have been determined. Author

N71-35787* Scripta Technica, Inc., Washington, D.C.

BRIEF DESCRIPTION OF THE PILOT PLANT INSTALLATION AND THE INCORE-THERMIONIC REACTOR [KURZE BESCHREIBUNG DER VERSUCHSANLAGE UND DES INCORE-THERMIONIK-REAKTORS]

NASA Aug. 1971 40 p Transl. into ENGLISH from Incore-Thermionik-Reaktor, Dec. 1970 35 p (Contract NASw-2036)

(NASA-TT-F-13744) Avail: NTIS CSCL 18E

The high electrical power density of the thermionic converter, the installation of this energy converter in the core of a reactor, and the liquid metal cooling yields a very compact

05 ENERGY CONVERSION

arrangement for a small power plant. The static operating mode and the property of converting thermal energy at a high temperature into electrical energy, with adequate thermal efficiency, are described. The proposed experimental reactor is a prototype for use in spaceflight. The waste heat is led out of the core at high temperature and the experimental installation is also conceptually oriented toward testing under the environmental conditions of space. These environmental conditions are produced by a vacuum system, which allows simulating the thermal radiation from the reactor tank and reflector surface in space. Author

N71-36450* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

COMBINED TURBINE-MAGNETOHYDRODYNAMIC BRAYTON CYCLE POWER SYSTEM FOR SPACE AND GROUND USE

Lester D. Nichols Washington Oct. 1971 48 p refs

(NASA-TN-D-6513; E-6442) Avail: NTIS CSCL 10A

A combined turbine-MHD generator operating in a Brayton cycle with a NERVA nuclear reactor is considered, both for use in space and on the ground. The combined system is compared with an all-MHD Brayton system and an all-turbine system. The combined cycle systems have higher thermodynamic efficiencies than the other systems. The combined system with 1500 K turbine inlet and the all-MHD system with generator efficiency of 0.8 have the lowest specific recuperator plus radiator mass of those systems considered. But the combined system considered has an average radiator temperature of 200 to 250 K lower than the other. For ground use, a cycle efficiency of greater than 0.55 can be achieved. Author

N71-36452* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

POWER AND LOAD PRIORITY CONTROL CONCEPT FOR A BRAYTON CYCLE POWER SYSTEM

Eugene L. Kelsey and Richard N. Young Washington Oct. 1971 27 p refs

(NASA-TN-D-6478; L-7865) Avail: NTIS CSCL 10B

A load-oriented control system is conceived and applied to a Brayton cycle turbo-alternator. The concept provides speed control and field current control for the alternator and a load simulation which includes energy storage. A laboratory model was constructed and tested with the Brayton cycle demonstrator at the Manned Spacecraft Center. Author

N71-37044* Oak Ridge National Lab., Tenn.

ISOTOPIE ELECTRIC GENERATORS

Francoise Laveissiere Apr. 1971 10 p Transl. into ENGLISH from the French report CEA-Bib-190

(ORNL-TR-2485; CEA-Bib-190) Avail: AEC Depository Libraries

Technical and economic information on the achievements of several countries (USA, France, UK, Euratom, USSR, and Canada) on isotopic electricity generators are presented. Information on the radioisotope used, activity of the source, output wattage, generator lifetime, manufacturer, type of conversion used, generator weight, and primary use are given. Author (NSA)

N71-37309* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

LIMIT CHARACTERISTICS OF AN MHD GENERATOR WITH A NONEQUILIBRIUM PLASMA

A. V. Gubarev et al 29 Jan. 1971 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Energ. Transp. (USSR), no. 1, 1970 p 167-170

(AD-726588; FTD-HT-23-898-70) Avail: NTIS CSCL 10/2

By using known relationships of the energy balance for electrons and dependence of the conductivity of a turbulent plasma on the Hall parameter, the authors obtained useful relationships which permit evaluating the maximum parameters of an MHD generator operating on a nonequilibrium plasma. It

is shown that with argon having an addition of cesium vapors at an electric load coefficient of 0.8 the maximum pressure in the reactor must not exceed 100 atmospheres absolute, even at the presently practically limiting values of reactor outlet gas temperature approximately 2500 degrees K, magnetic field induction approximately 10 T, and power of a given single MHD generator channel. It is shown that with a reduction in M number from 2.0 to 0.5 the maximum permissible pressure in the reactor is reduced from 70 to approximately 20 atm abs. With an increase in initial temperature and the other parameters remaining constant, the maximum value of capacity of a single unit is reduced. The article contains four illustrations. Author (GRA)

N71-37624* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PROSPECTS FOR THE APPLICATION OF HIGH TEMPERATURE FUEL CELLS

I. L. Kolbenev et al 29 Jan. 1971 11 p refs Transl. into ENGLISH from Energomashinost. (Moscow), no. 4, 1970 p 30-31

(AD-727497; FTD-HT-23-894-70) Avail: NTIS CSCL 10/2

The work is concerned with prospects for application of high-temperature fuel cells (HTFC) as power sources. Results of analytical research on determination of cell parameters as functions of working process temperature and fuel type are given. Author (GRA)

N71-38010* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MEASURING DEVICES OF A COMPUTER CONTROL SYSTEM FOR AUTOMATING HEAVY DUTY POWER UNITS OF A THERMOELECTRIC POWER STATION

Yu. I. Semko et al 5 Feb. 1971 14 p Transl. into ENGLISH from the Russian

(AD-727461; FTD-HT-23-899-70) Avail: NTIS CSCL 14/2

In the development of computer controlled measuring devices a large number of factors dealing with the object to be automated should be considered. These include varying voltage, varying temperatures, the location of the equipment and how it is grounded. The equipment is provided with means for protection from overloads and other defects. Author (GRA)

N71-38463* California Univ., Livermore. Lawrence Radiation Lab.

EXPERIMENTAL AND COMPUTATIONAL INVESTIGATIONS OF THE DIRECT CONVERSION OF PLASMA ENERGY TO ELECTRICITY

R. W. Moir, W. L. Barr, R. P. Freis, and R. F. Post 13 May 1971 20 p refs Presented at 4th Conf. on Plasma Phys. and Controlled Nucl. Fusion Res., Madison, Wis., 17-23 Jun. 1971 Submitted for publication; sponsored by AEC (Conf-710607-126; CN-28/K-1; UCRL-72879) Avail: NTIS

Energy is recovered from mirror and losses by expansion in static magnetic fields (to convert perpendicular energy components to parallel), separation of ions from electrons, and, finally, deceleration and selective collection of the particles after each has lost most of its original kinetic energy. Analysis indicates that overall efficiencies of about 90% might be attainable. In the system being investigated, the energy-dependent focusing property of periodic electrostatic lenses aids the separation. Computer-derived designs were tested in scaled laboratory experiments, in which variable-energy ion beams were used to study a 22-cell collector system in detail. Under one set of operating conditions the measured efficiency averaged at constant current density over a range of 2 in energy was 88%, whereas computer-simulation calculations for the same case gave 92%; the ideal theoretical maximum efficiency under these conditions would be 97%. Author (NSA)

N71-38510* Office of Naval Research, Arlington, Va. SUPERCONDUCTING TECHNOLOGY IN JAPAN

Richard G. Brandt Jun. 1971 17 p (AD-727094; ONR-28) Avail: NTIS CSCL 20/12

Superconducting technology in Japan is in an advanced state and merits continuing attention by outside observers. The university research effort is strong but not unique, with a few exceptions. The real strength is in the industrial effort whose impetus is supplied by the national projects. In the absence of these national projects, there is not enough demand to sustain the many companies involved. High-energy experimental physics and related research efforts are relatively deemphasized in Japan, and thus do not create the same demand for superconducting magnets that exists in our country and in Europe. However, the two national projects--for MHD power generation and the planned project for train levitation--are in the forefront of advancing technology, not duplicated in magnitude by efforts elsewhere. These and other attempts to develop large-scale applications are the most significant aspect of superconducting technology in Japan. Contrasted with these pioneering efforts, research and development on Josephson effect devices lags behind work in progress in other countries. Author (GRA)

N72-10782# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME QUESTIONS OF THE EFFECTIVENESS OF THE PRODUCTION OF ELECTROENERGY IN MHD-GENERATOR IN A NONEQUILIBRIUM PLASMA

A. V. Gubarev, V. V. Braev, and V. A. Gurashvili Feb. 1971 86 p refs Transl. into ENGLISH of the book "Nekotorye Voprosy Effektivnosti Proizvodstva Elektroenergii v MGD-generatorakh na Neravnovesnoi Plazme" Moscow, 1968 p 1-66

(FTD Proj. 6040102)

(AD-724973; FTD-MT-24-253-70) Avail: NTIS CSCL 10/2

The work deals with efficiency of electric power production in magnetohydrodynamic generators, mainly on nonequilibrium plasma, in application to stationary high power plants. The authors prove that the future of such plants with a linear sectional conduction Faraday generator is very doubtful because with given field inductions, given reactor pressure and given gas temperature, which seem to represent the technological limits for the next decade, efficiency of the power plant will not exceed 40 percent. Even with very optimistic assumptions, with a given reactor pressure, power plant efficiency of greater than 50 percent can be reached with a unit power of the magnetohydrodynamic generator of given amount. These low efficiency values of the power plant are due to the fact that the physical operating principle (plasma ionization, and others) of the generator under consideration and its electrogasdynamic circuit prevents achieving high efficiency of internal energy conversion in the channel.

GRA

N72-10852# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
MEASUREMENTS OF PLASMA PARAMETERS IN A SIMULATED THERMIONIC CONVERTER

K. Shimada In its JPL Quart. Tech. Rev., Vol. 1, No. 3 Oct. 1971 p 97-109 refs

Avail: NTIS CSCL 18K

CONTENTS:

1. THE CHARACTERIZATION OF FACSIMILE CAMERA SYSTEMS FOR LUNAR AND PLANETARY SURFACE A. Eisenman p 1-16 refs

2. RELIABILITY ESTIMATION PROCEDURES AND CARE: THE COMPUTER-AIDED RELIABILITY ESTIMATION PROGRAM F. P. Mathur p 17-26 refs

3. COMPUTER PROGRAM FOR THE AUTOMATED ATTENDANCE ACCOUNTING SYSTEM P. Poulsen and C. Rasmussen p 27-32 refs

4. ONSET OF SUPERCONDUCTIVITY IN SODIUM AND POTASSIUM INTERCALATED MOLYBDENUM DISULPHIDE R. B. Somoano and A. Rembaum p 33-37 refs

5. LONG-TERM AGING OF ELASTOMERS: CHEMICAL STRESS RELAXATION OF FLUOROSILICONE RUBBER AND OTHER STUDIES S. H. Kalfavan, A. A. Mazzeo, and R. H. Silver p 38-47 refs

6. TOPS ATTITUDE PROPULSION SUBSYSTEM TECHNOL-

OGY P. I. Moynihan p 48-56 refs

7. LONG-DURATION FIRINGS OF A MARINER MARS 1969 CATALYTIC REACTOR T. W. Price p 57-66 refs

8. SIMULATION OF MARINER MARS 1971 SPACECRAFT N. E. Ausman, Jr., N. K. Simon, and C. F. Rodriguez p 67-78 refs

9. MINICOMPUTER-CONTROLLED PROGRAMMED OSCILLATOR R. Winkelstein p 79-87 refs

10. A MULTIPLE-BEAM SPHERICAL REFLECTOR ANTENNA R. Woo p 88-96 refs

11. MEASUREMENTS OF PLASMA PARAMETERS IN A SIMULATED THERMIONIC CONVERTER K. Shimada refs

12. HIGH-POWER MICROSTRIP RF SWITCH S. D. Choi p 110-124 refs

13. DYNAMIC UPPER ATMOSPHERIC FORCE MODEL ON STABILIZED VEHICLES FOR A HIGH-PRECISION TRAJECTORY COMPUTER PROGRAM A. R. Khatib p 125-132 refs

14. A VIKING SATELLITE ORBIT TRIM STRATEGY G. R. Hintz p 133-142 refs

N72-11066# Avco-Everett Research Lab., Everett, Mass.
EXPERIMENTAL RESEARCH ON A 400 kW HIGH POWER DENSITY MHD GENERATOR Final Technical Report, Jun. 1967 - Dec. 1970

O. K. Sonju, J. Teno, J. W. Lothrop, and S. W. Petty Wright-Patterson AFB, Ohio AFAPL May 1971 195 p refs (Contract F33616-67-C-019; AF Proj. 3145)

(AD-725739; AFAPL-TR-71-5) Avail: NTIS CSCL 10/2

An MHD Generator Facility was designed, constructed and placed in operation. The Facility is described and operating, maintenance, safety and calibration instructions and procedures are given. The Facility was utilized to measure conductivity of hydrocarbon-oxygen combustion gases seeded with cesium salts. A factor of two improvement in electrical conductivity as compared with potassium seeding was observed. A high specific power output (0.5 MW/kg/sec) MHD generator at the 300-400 kilowatt output level was designed and built for cyanogen-oxygen operation. The design of the generator is described, as are the modifications to the AERL Mark II facility which were required in order to test the generator. In spite of the system imperfections encountered the ability of an MHD generator to produce high specific output in the submegawatt power range with conventional hydrocarbon fuels was conclusively demonstrated. Author (GRA)

N72-11610# Centralny Instytut Informacji Naukowo-Technicznej i Ekonomicznej, Warsaw (Poland).

NUKLEONIKA, VOLUME 16, NO. 3, 1970

1970 74 p refs Transl. into ENGLISH from Nukleonika (Poland), v. 16, no. 3, 1970 p 237-316 Sponsored in part by AEC and NSF

(AEC-Tr-7102/3; TT-70-55010/3; UC-34) Avail: NTIS

The effect of the distribution of gas parameters in a cross sectional area of an MHD generator upon its electrical performance was analyzed. The method of electrical equivalent circuits was used. The problem was divided into two parts in order to obtain results in general form: (1) the nonuniformity of gas parameters in a y direction only, and (2) the gas nonuniformity in a z direction. The derived expressions make it possible to determine the distribution of electrical values (current density, electrical potential, and effective gas conductivity) in the channel cross section of the MHD generator, and to calculate its terminal values when the distribution functions of the gas parameters are specified. Author

N72-11639# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

APPLIED MAGNETOHYDRODYNAMICS, NO. 7: ELECTRICAL LOSSES IN THE MHD GENERATOR (ANGEWANDTE MAGNETOHYDRODYNAMIK, HEFT 7: UBER ELEKTRISC-

05 ENERGY CONVERSION

HE VERLUSTE IM MHD-GENERATOR

Christian Holzpfel Mar. 1971 65 p refs In GERMAN;
ENGLISH summary
(JUL-742-TP) Avail: AEC Depository Library

By separation of the flow system in an MHD generator into boundary layer and bulk, a simple model of the electrical conditions in the bulk flow of the generator is set up. With this model, the influence of the reductions of the Hall field on the other parameters in the generator is described by use of a generalized characteristic. With increasing magnetic field, a saturation of the Faraday voltage appears. The calculation shows that this saturation appears in the lower region of the magnetic field where no electrothermal instabilities appear. At higher magnetic fields with electrothermal instabilities, the Faraday voltage increases again with increasing magnetic field. Moreover, there exists a lower limit of the velocity below which no nonequilibrium ionization appears if the resistance in the diffuser due to which the Hall field is reduced is too low. On the other hand, there exists an upper limit of the velocity in the subsonic case in a generator with constant cross section above which the Mach number increases to the value 1 due to the energy conversion in the generator. Author (NSA)

N72-11641# Princeton Univ., N.J. Plasma Physics Lab. CONSIDERATION OF POWER REQUIREMENT IN FUSION FEASIBILITY EXPERIMENT

S. Yoshikawa Jun. 1971 17 p refs
(Contract AT(30-1)-1238)
(MATT-803) Avail: NTIS

Assuming that pseudoclassical diffusion theory holds to the reactor condition, the estimate of power requirement of plasma heating in self-sustaining toroidal fusion devices is made. It is found that various heating methods such as neutral beam injection, rf heating, etc., are reasonably competitive from the power requirement except for the relativistic electron beam injection, which may be financially too difficult. The advantage of the astronospherator combination was noted. Author (NSA)

N72-12136* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INTEGRATED THERMOELECTRIC GENERATOR/SPACE ANTENNA COMBINATION Patent

Gerald L. Pucillo, inventor (to NASA) Issued 20 Jul. 1971 4 p
Filed 29 Oct. 1968

(NASA-Case-XER-09521; US-Patent-3,594,803;
US-Patent-Appl-SN-771530; US-Patent-Class-343-720;
US-Patent-Class-343-DIG.3; US-Patent-Class-343-840;
US-Patent-Class-136-202; US-Patent-Class-136-206;
US-Patent-Class-136-227) Avail: US Patent Office CSCL 09E

An integrated thermoelectric generator/antenna is described. An antenna is formed of a sandwich of hot and cold thermoelectric elements, such as bismuth and tellurium. Power storage means are connected to the antenna to receive and store the power generated by the thermoelectric action between the elements. In addition, means are connected to the antenna so that the antenna transmits and receives signals. A separate source of heat is connected to the hot thermoelectric element to provide an auxiliary source of heat for that element when the antenna is not receiving energy from a hot body.

Official Gazette of the U.S. Patent Office

N72-12166*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

STATUS OF POWER GENERATION EXPERIMENTS IN THE NASA LEWIS CLOSED CYCLE MHD FACILITY

Ronald J. Sovie and Lester D. Nichols [1971] 10 p refs
Presented at the 10th Aerospace Sci. Meeting, San Diego,
17-19 Jan. 1972; sponsored by AIAA
(NASA-TM-X-67975) Avail: NTIS CSCL 14B

The design and operation of the closed cycle MHD facility is

discussed and results obtained in recent experiments are presented. The main components of the facility are a compressor, recuperative heat exchanger, heater, nozzle, MHD channel with 28 pairs of thoriated tungsten electrodes, cesium condenser, and an argon cooler. The facility has been operated at temperatures up to 2100 K with a cesium-seeded argon working fluid. At low magnetic field strengths, the open circuit voltage, Hall voltage and short circuit current obtained are 90, 69, and 47 percent of the theoretical equilibrium values, respectively. Comparison of this data with a wall and boundary layer leakage theory indicates that the generator has shorting paths in the Hall direction.

Author

N72-13211# General Electric Co., Philadelphia, Pa. Space Div. INVESTIGATION OF A LARGE SCALE NONEQUILIBRIUM MAGNETOHYDRODYNAMIC GENERATOR Annual Report, 1 Aug. 1970 - 31 Jul. 1971

Bert Zauderer Aug. 1971 19 p refs
(Contract N00014-70-C-0321; Proj. 9800)
(AD-728407) Avail: NTIS CSCL 10/2

The report presents a summary of the progress during the past year on a continuing investigation aimed at determining the operating characteristics of the linear, non-equilibrium MHD generator. The main effort of the past year was concentrated on reducing the electrode losses in the generator by using heated electrodes which protruded into the gas stream. Using an MHD channel, which was specially constructed for this purpose, large scale electrical power was obtained for the first time in cesium seeded, noble gases at gas stagnation temperatures as low as 2000K. Various electrode structures, both hot and cold, were investigated; but the electrode design was not as important as the cesium concentration in determining the electrode drops. During the past year, construction of a larger MHD channel and of a considerably more powerful MHD magnet and power supply were nearly completed. Author (GRA)

N72-13698# Army Foreign Science and Technology Center, Charlottesville, Va.

STUDY OF A MODEL OF AN MHD GENERATOR USING AN ARGON POTASSIUM PLASMA

N. M. Maslennikov and V. N. Gernanyuk 21 Jul. 1971 16 p
refs Transl. into ENGLISH from the monograph Issledovanie
Modeli MGD-Generators na Argono-Kalievoy Plazme, Magnitogid-
rodinamicheskii Metod Polucheniya Elektroenergii (USSR)
(AD-728591; FSTC-HT-23-785-71) Avail: NTIS CSCL 10/2

The electrical conductivity of an argon-potassium plasma is measured in an induced electric field with a static gas temperature of 1300-1500K, pressure in the stream 0.04 atm. The currents flowing between electrodes were studied, as well as the cathode and anode voltage drop on potassium-activated electrodes. During optical measurements, the influence of the plasmotron arc on the spectrum and electrical conductivity of the plasma was studied. Author (GRA)

N72-14040# Pratt and Whitney Aircraft, East Hartford, Conn. A 1.5 KW FUEL CELL POWERPLANT Final Report, 1 Jul. 1970 - 30 Jun. 1971

Thomas G. Schiller and Alfred P. Meyer Jun. 1971 163 p
(Contract DAAK02-70-C-0158; Contract DA
Proj.1-G-663702-DG-1003)
(AD-730796; PWA-4210) Avail: NTIS CSCL 10/2

A 1.5 KW fuel cell powerplant was designed for field power supply. The design was validated by testing a breadboard powerplant incorporating the features of the design. It operates automatically on military logistic fuels over a 0-1.65 KW output power range. The powerplant consists of a dual bed regenerative thermal cracker, an air-cooled phosphoric acid fuel cell subsystem, a solid state voltage regulator, and an automatic control unit. The design is validated by 153 hours of operation of a functionally identical breadboard powerplant. An analysis was conducted to determine the potential of the powerplant.

Author (GRA)

N72-15235# Office of Naval Research, London (England).
THE 5TH INTERNATIONAL CONFERENCE ON MAGNETO-HYDRODYNAMIC ELECTRICAL POWER GENERATION
 Alfredo Banos, Jr. 16 Jul. 1971 26 p refs Conf. held at Munich, 19-23 Apr. 1971
 (AD-730450; ORNL-C-15-71) Avail: NTIS CSCL 10/2

The report gives an account of the last three sessions which included round table discussions by panels of experts. In addition, the Appendix gives a complete list of the papers presented. Author (GRA)

N72-17956# Joint Publications Research Service, Washington, D.C.
THERMODYNAMIC EFFICIENCY OF URANIUM-HEXA-FLUORIDE MHD-PLANTS

I. I. Gutman, V. A. Dmitriyevskiy, and S. D. Tetelbaum 7 Feb. 1972 7 p refs Transl. into ENGLISH from Tepl. Vysokikh Temperatur (Moscow), v. 9, no. 6, Dec. 1971 p 1329-1331 (JPRS-55126) Avail: NTIS

The possibilities for using a gaseous nuclear fuel in a gas reactor and in magnetohydrodynamic plants are considered. The application of uranium hexafluoride is discussed as a nuclear fuel at temperatures providing for ionization of the pure uranium. Problems associated with radiation safety, materials for channels and electrodes, and reactor cooling are reviewed. K.P.D.

N72-20784# Council for Scientific and Industrial Research, Pretoria (South Africa).

WANKEL ENGINES FOR AIRCRAFT

J. Falecki Feb. 1971 10 p refs Transl. into ENGLISH from Tech. Lotnicza i Astronaut. (POLAND), v. 24, no. 6, 1969 p 12-15

(Rept-908) Avail: NTIS

The Wankel engine is compared with conventional and jet aircraft engine for application to light aircraft propulsion. The characteristics of the engines for light aircraft and helicopters are presented. The advantages of the Wankel engine from the standpoint of simplicity, smooth operation, power output, and fuel consumption are examined. Graphs are presented to show the comparative performance of the engines for power output, specific fuel consumption, cost and effects of altitude on power output. Author

N72-21497# Air Force Systems Command, Wright-Patterson AFB, Ohio.

MULTIMEGAJoule, Pulsing, Explosive Driven MHD Feasibility Study

Ronald Pape Nov. 1971 74 p refs
 (AF Proj. 3145)

(AD-735680; AFAPL-TR-71-11) Avail: NTIS CSCL 10/2

The document reports on a preliminary investigation to determine whether explosive driven magnetohydrodynamics (MHD) can be scaled to multimegajoule levels and produce quickly repeating pulses at these high energy levels. In the study, pulse durations below one millisecond are of primary concern.

Author (GRA)

N72-23053# General Electric Co., Lynn, Mass. Aircraft Energy Conversion Div.

FUEL CELL TECHNOLOGY PROGRAM Summary report

25 Aug. 1972 22 p

(Contract NAS9-11033)

(NASA-CR-115572; SPR-046) Avail: NTIS HC \$3.25 CSCL 10A

A program to advance the technology for a cost-effective hydrogen/oxygen fuel cell system for future manned spacecraft is discussed. The evaluation of base line design concepts and the development of product improvements in the areas of life, power, specific weight and volume, versatility of operation, field maintenance and thermal control were conducted from the

material and component level through the fabrication and test of an engineering model of the fuel cell system. The program was to be accomplished in a 13 month period. Author

N72-23675# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

AN OUT-OF-CORE THERMIONIC-CONVERTER SYSTEM FOR NUCLEAR SPACE POWER

Roland Breitwieser 1972 26 p refs Presented at 3d Intern. Conf. on Thermionic Elec. Power Generation, Juelich, West Germany, 5-9 Jun. 1972

(NASA-TM-X-68049; E-6890) Avail: NTIS HC \$3.50 CSCL 18I

Design of the nuclear thermionic space power system, 40 50 70 Kw(e) power range, are given. The design configuration (1) meets the constraints of readily available launch vehicles; (2) allows for off-design operation including startup, shutdown, and possible emergency conditions; (3) provides tolerance of failure by extensive use of modular, redundant elements; (4) incorporates and uses heat pipes in a fashion that reduces the need for extensive in-pile testing of system components; and (5) uses thermionic converters, nuclear fuel elements, and heat transfer devices in a geometrical form adapted from existing incore thermionic system designs. Designs and in some cases performance data for elements and groups of the elements of the system are included. Benefits of the highly modular system approach to reliability, safety, economy of development, and flexibility are discussed. Author

N72-24139# Westinghouse Electric Corp., Pittsburgh, Pa.
THERMOELECTRIC HEATING AND VENTILATING SYSTEM
 Final Report, Oct. 1969 - Aug. 1971

A. M. Bernard Nov. 1971 35 p ref

(Contract DAAG17-70-C-0044; DA Proj. 1J0-62110-AJ-33)

(AD-737720; USA-NLABS-TR-72-26-CE) Avail: NTIS CSCL 06/17

Modifications and improvements incorporated into a thermoelectric heating and ventilating system are described. The thermoelectric heating and ventilating system is designed to provide a flow of temperature regulated air for use in heating or ventilating a specially designed military clothing ensemble. The system weighs ten pounds unfueled and required 0.26 pounds of fuel for each hour of operation. Eighteen c.f.m. of air S.T.P. conditions at four inches water column pressure is delivered for use in keeping an individual in thermal balance when operating in extreme environments (-40F to +110F) or when exposed to hazards. The electrical power required to obtain the flow of air is supplied by a thermoelectric generator which converts thermal energy directly into electrical energy. The thermal energy is derived from the combustion of liquid military fuels: leaded gasoline, kerosene, JP-4 and diesel fuels. Author (GRA)

N72-24755# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THE EFFECT OF WALL FRICTION ON MAGNETOHYDRODYNAMIC GENERATOR PERFORMANCE

Allan R. Bishop Washington May 1972 21 p refs

(NASA-TN-D-6804; E-6436) Avail: NTIS HC \$3.00 CSCL 20I

The effect of wall friction on magnetohydrodynamic generator performance is determined by introduction of a wall friction factor into the one-dimensional generator equations. This addition should be useful in improving generator analysis and determining optimum generator geometry. The curves presented can be used to determine the effects of changes in wall friction and generator performance. Wall friction has an increasing effect on the Mach number increases and a decreasing effect as the pressure drop across the generator increase. Author

N72-26031* Westinghouse Electric Corp., Pittsburgh, Pa.
THERMALLY CASCADED THERMOELECTRIC GENERATOR
 Patent

05 ENERGY CONVERSION

Robert Flaherty, inventor (to NASA) Issued 30 May 1972 8 p
Filed 24 Jul. 1969 Supersedes N70-10898 (08-01, p 0008)
Sponsored by NASA
(NASA-Case-NPO-10753; US-Patent-3,666,566;
US-Patent-Appl-SN-844355; US-Patent-Class-136-202) Avail:
US Patent Office CSCL 10A

A thermally cascaded thermoelectric generator is disclosed. The generator includes a first stage containing high-temperature thermoelectric elements and a second stage containing lower temperature thermoelectric elements. The stages are connected in thermal series by means of an elongated heat transfer pipe containing a liquid metal and a wick. A portion of the heat radiated to the first stage from a high temperature radioisotope source is converted to electricity. The heat rejected by the first stage is conducted to the heat pipe and absorbed by the liquid metal as latent heat of vaporization. The vapor rises to the second stage and condenses to give up latent heat of condensation which is transferred to the second stage and is converted to electricity therein. The condensed liquid returns on the wick to the vicinity of the first stage.

Official Gazette of the U.S. Patent Office

N72-27058* National Academy of Sciences-National Research Council, Washington, D.C.

THEORETICAL EFFICIENCY CONSIDERATIONS FOR PHOTOVOLTAIC ENERGY CONVERTERS

Hans J. Quieser *In its Solar Cells: Outlook for Improved Efficiency* 1972 p 50-55 refs

CSCL 10A

The problem is reviewed of the maximum efficiency of a solar energy converter that can be predicted by first principles and practical efficiency limits that seem reasonable within the state of the art. The p-n junctions in inorganic semiconductors are emphasized. The thermodynamic limit and principal restrictions in approaching this limit are reviewed. Practical improvements beyond today's technology seem possible, especially for silicon, if the knowledge about hole-electron recombination is increased. Brief comments on a variety of proposals for efficiency increase are included. Author

N72-27067# Office of Naval Research, Washington, D.C.
SOME ASPECTS OF JAPANESE ENERGY-CONVERSION RESEARCH AND DEVELOPMENT

Ralph Roberts 29 Feb. 1972 30 p
(AD-739325; ONR-29) Avail: NTIS CSCL 21/9

The Japanese effort in chemical propulsion has shown a marked technological advance in capabilities in the 10 years since the prior visit of the author. However, in spite of this growth, there was little evidence of marked new contributions by the Japanese. For the most part, excellent application has been made of technology developed, primarily in the United States. Continued growth in this field can be anticipated, with increased Japanese capability in satellites orbiting with larger payloads. In addition a shift from solid-propellant to liquid-propellant rockets may take place; however, this is not anticipated within less than 5 years except by licensing from U.S. corporations of purchase of high-thrust liquid-propellant rocket motors. The same situation generally prevails in the fuel-cell and battery activities visited. In this field the close ties to U.S. development, as in the case of solid-propellant rocketry, were apparent. It will be especially interesting to observe the future fuel-cell developments and whether fuel cells will be reduced to submarine practice.

Author (GRA)

N72-27230* Duke Univ., Durham, N.C. School of Engineering.
REGULATED dc TO dc CONVERTER FOR VOLTAGE STEP-UP OR STEP-DOWN WITH INPUT-OUTPUT ISOLATION Patent Application

Sam Y. M. Feng and Thomas G. Wilson, inventors (to NASA)

Filed 18 Apr. 1972 27 p
(Grant NGL-34-001-001)

(NASA-Case-HQN-10792-1; NASA-Case-HQN-10793-1;
US-Patent-Appl-SN-245063) Avail: NTIS HC \$3.50 CSCL 09E

A closed loop regulated dc-to-dc converter employing an unregulated two winding inductive energy storage converter is described that uses a magnetically coupled multivibrator acting as a duty cycle generator to drive the converter. The multivibrator is comprised of two transistor switches and a saturable transformer. The output of the converter is compared with a reference in a comparator which transmits a binary zero until the output exceeds the reference. When the output exceeds the reference, the binary output of the comparator drives transistor switches which control the multivibrator to turn it off. NASA

N72-28685* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

THE DIMINIODE: A RESEARCH AND DEVELOPMENT TOOL FOR NUCLEAR THERMIONICS

James F. Morris Washington Aug. 1972 17 p refs

(NASA-TM-X-2586; E-6862) Avail: NTIS HC \$3.00 CSCL 18J

Diminiodes are fixed-or variable-gap cesium diodes with plane miniature emitters and guarded collectors. In addition to smallness, their relative advantages are simplicity, precision, ease of fabrication, interchangeability of parts, cleanliness, full instrumentation, ruggedness, and economy. With diminiodes and computers used in thermionic performance mapping, a thorough electrode screening program becomes practical. Author

N72-28731# CIT Compagnie Industrielle des Telecommunications, Bruyeres-le-Chatel (France). Centre Pierre Herreng.
THERMOELECTRIC CONVERSION PROCESS: APPLICATION TO RADIOISOTOPE SOURCES

Alais and Stahl 20 Apr. 1971 20 p refs In FRENCH
Presented at Intern. Conf. on Chem. Sci., Paris, 20 Apr. 1971
(FRNC-Conf-13; Conf-710444-6; Rept-280.71.347) Avail: AEC Depository Libraries

The efficiency of a thermoelectric generator depends on two factors: the conversion yield of the thermoelectric material and the thermal losses due to imperfections in the insulator. The various semiconducting elements used in these generators are classified according to their working temperature: for a given type of material the thermal losses include a term which is independent of the thickness of the insulator. Examples are presented of the GISETTE V, a 15w underwater generator, possessing a 70,000 Ci strontium titanate hot source and GIPSIE, a generator used with pacemakers. The radioisotopes commonly used in thermoelectric generators are listed. NSA

N72-29045# Army Foreign Science and Technology Center, Charlottesville, Va.

THERMOELECTRIC GENERATORS

A. S. Okhotin, A. A. Efremov, V. S. Okhotin, and A. S. Pushkarskii 22 Mar. 1972 369 p refs Transl. into ENGLISH of the publ. "Termoelektricheskiye generatory" Moscow, 1971 p 3-288

(AD-741858; FSTC-HT-23-1023-72) Avail: NTIS CSCL 10/2

The book is devoted to various aspects of the problem of thermoelectric conversion to thermal energy into electric. Examined are physico energetic principles of thermoelectricity, the present state of physics of the thermoelectric process, properties of semi conducting materials, various methods to calculate simple and complex thermoelectric construction. Described are thermoelectric generators of various types, designs and their purpose.

Author (GRA)

N72-29734# Massachusetts Inst. of Tech., Cambridge. Space Propulsion Lab.

RESEARCH ON NONEQUILIBRIUM MHD GENERATORS

Annual Technical Progress Report, 1 Feb. - 31 Dec. 1970

J. L. Kerrebrock Jul. 1971 54 p refs
(Contract F33615-69-C-1226)

(AD-740572; AFAPL-TR-71-45) Avail: NTIS CSCL 10/2

A summary is presented of progress in a study of nonequilibrium generators, with emphasis on the vibrational excitation of molecular species. Experimental work on a large generator includes development of a coaxial preionizer and development of slanted electrode walls, both of which increase the power density of the generator. A three-dimensional analysis of the slanted electrode wall is also given. Finally a preliminary report is given of experimental and theoretical work on the effect of an intense radiation field, coupled to the molecules, on electrothermal instabilities.

Author (GRA)

N72-30029* Pratt and Whitney Aircraft, East Hartford, Conn. South Windsor Engineering Facility.

FUEL CELL TECHNOLOGY PROGRAM CONTRACT SUMMARY REPORT Summary Report

24 Feb. 1972 21 p

(Contract NAS9-11034)

(NASA-CR-128519; PWA-4363) Avail: NTIS HC \$3.25 CSCL 10A

A fuel cell technology program which was established to advance the state-of-the-art of hydrogen-oxygen fuel cells using the P and WA PC8B technology as the base is reported. The major tasks of this program consisted of (1) fuel cell system studies of a space shuttle powerplant conceptual design (designated engineering model -1, EM-1) supported by liaison with the space shuttle prime contractors; (2) component and subsystem technology advancement and; (3) a demonstrator powerplant test. Fuel cell system studies, with the EM-1 as the focal point of design activities, included determination of voltage regulation, specific reactant consumption, weight, voltage level and performance characteristics. These studies provided the basis for coordination activities with the space shuttle vehicle prime contractor. Interface information, on-board checkout and in-flight monitoring requirements, and development cost data were also provided as part of this activity. Even though the two vehicles primes had different voltage requirements (115 volts in one case and 28 volts in the other), it was concluded that either option could be provided in the fuel cell power system by the electrical hook-up of the cells in the stack.

Author

N72-30655* Illinois Univ., Chicago. Dept. of Energy Engineering.

MAGNETOHYDRODYNAMIC GENERATOR EXPERIMENTAL STUDIES

Edward S. Pierson 12 Jun. 1972 36 p refs Prepared for JPL

(Contracts NAS7-100; JPL-952985)

(NASA-CR-127891) Avail: NTIS HC \$4.00 CSCL 20I

The results for an experimental study of a one wavelength MHD induction generator operating on a liquid flow are presented. First the design philosophy and the experimental generator design are summarized, including a description of the flow loop and instrumentation. Next a Fourier series method of treating the fact that the magnetic flux density produced by the stator is not a pure traveling sinusoid is described and some results summarized. This approach appears to be of interest after revisions are made, but the initial results are not accurate. Finally, some of the experimental data is summarized for various methods of excitation.

Author

N72-32078* Whiteley Industries, Inc., Wilmington, Mass.

POWER GENERATING SUBCOMPONENT/FUEL CELL MODULE Final Report, Feb. 1970 - Dec. 1971

R. E. Salathe and R. J. Dumas May 1972 84 p refs

(Contract DAA807-70-C-0136)

(AD-744477; ECOM-0136-F) Avail: NTIS CSCL 10/2

A hydrazine air fuel cell power generating module capable of 120 watts continuous output was designed, constructed, evaluated. The fuel cell module incorporated design features permitting low cost manufacturing techniques to be used. This

approach permits the economic use of the desirable characteristics of a fuel cell power module with the life attainable commensurate with the present state of the art. A fuel cell module from the units delivered was selected at random and subjected to an evaluation test program. The report describes the original design as represented by the Design Plan, the Final Design incorporated in the delivered hardware, and the Evaluation Testing Conducted to assure compliance with the contract technical requirements.

Author (GRA)

N72-33063* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INFLUENCE OF BOUNDARY LAYERS ON THE ELECTRICAL CHARACTERISTICS OF MHD GENERATORS

Yu. M. Volkov, D. D. Malyuta, and V. P. Panchenko 10 Mar. 1972 47 p refs Transl. into ENGLISH of the publ. "Vliyaniye Pogranichnykh Sloyez na Elektricheskiye Kharakteristiki MGD Generators" Moscow, Inst. of Atomic Energy, 1970 p 1-28

(AD-745245; FTD-MT-24-1635-71) Avail: NTIS CSCL 10/2

An analysis is made of the boundary layer effect on the electrical characteristics of a Faraday MHD generator. An electrical substitution circuit and a method for calculating its elements are proposed. An analysis is made of the local circuit for the substitution of a channel in a gas-dynamic approximation. It is noted that the questions of the flow of current through a turbulent boundary layer require careful examination. It has been shown that the existing methods for the calculation of real resistance of a boundary layer, which are based on a break in integration on a certain arbitrary boundary from the electrode, give results which are strongly dependent on the selection of this boundary.

Author (GRA)

N72-33065* Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE PRESENT AND FUTURE OF FUEL CELLS

V. S. Bagotskii and A. M. Skundin 11 Feb. 1972 17 p Transl. into ENGLISH from Khim. v Shkole (Moscow), v. 25, no. 3, 1970 p 10-16

(AD-743651; FTD-MT-24-1687-71) Avail: NTIS CSCL 10/2

Electric cells, fuel cells and heat engines are compared. The most common fuel cell using H₂ and O₂ is described in detail. Variations such as plastic-based electrodes, ion-exchange membranes, quasi-solid electrolytes, and high temperature cells are discussed.

Author (GRA)

N72-33068* Institute of Gas Technology, Chicago, Ill.

LOW-COST ACID FUEL CELL STACKS Final Report

Jun. 1972 108 p refs

(Contract DAAK02-67-C-0063)

(AD-744806) Avail: NTIS CSCL 10/2

The report concerns research to redesign and to improve compact, low-temperature, acid electrolyte fuel cell stacks. These stacks, which use low-platinum loading electrodes, are operated on air and reformed CITE fuel or combat gasoline.

Author (GRA)

N73-10247* Magnetic Corp. of America, Cambridge, Mass.

LIGHTWEIGHT SUPERCONDUCTING MHD MAGNETS. VOLUME 1: SADDLE MAGNET DESIGN, CONSTRUCTION AND PRELIMINARY TEST RESULTS Final Report, May 1970 - Mar. 1972

Richard J. Thome and John J. Stekly Jun. 1972 258 p

(Contract F33615-70-C-1567; AF Proj. 3145)

(AD-745321; AFAPL-TR-72-32-Vol-1) Avail: NTIS CSCL 09/1

This is the final report for the development of a superconducting magnet system for magnetohydrodynamic power generation. The information is presented in two volumes. Volume 1 describes the magnet development effort from the initial parametric analyses through design and supporting experimentation to the preliminary testing of the magnet in a vertical bucket type dewar.

Author (GRA)

05 ENERGY CONVERSION

N73-11717# Magnetic Corp. of America, Cambridge, Mass.
LIGHTWEIGHT SUPERCONDUCTING MHD MAGNETS. VOLUME 2: 10 MW LEVEL MAGNET SYSTEM DESIGN AND PROJECTIONS FOR FUTURE DEVELOPMENT Final Report, May 1970 - Mar. 1972

Richard J. Thome and John J. Stekly Wright-Patterson AFB, Ohio AFAPL Jun. 1972 70 p
(Contract F33615-70-C-1567; AF Proj. 3145)
(AD-745322 : AFCRL-TR-72-32-Vol-2) Avail: NTIS CSCL 09/1

This is the final report for the development of a superconducting magnet system for magnetohydrodynamic power generation. The information is presented in two volumes. Volume II describes the parametric optimization and design of a 10 megawatt level MHD superconducting magnet system and projections for future development. Author (GRA)

N73-12064# Argonne National Lab., Ill.
EXPERIMENTAL TWO PHASE LIQUID-METAL MHD GENERATOR PROGRAM Annual Report, 1 May 1971 - 1 May 1972

Lee C. Pittenger Jun. 1972 43 p refs
(Contracts NAonr-7-71)
(AD-747323; ANL/ETD-72-07) Avail: NTIS CSCL 10/2

Earlier analytical and experimental investigations of MHD power systems at ANL have revealed the potential high efficiencies of a constant-liquid-velocity two-phase liquid-metal dc MHD generator for converting fluid energy to electrical energy. These investigations also have identified, and have emphasized the need for in-depth studies of generator parameters affecting attainment of these efficiencies. This report describes the preparations for, and preliminary results of, a programmatic investigation of these parameters; in particular, the effects of relative velocity of the phases, friction, and mixture quality. Author (GRA)

N73-12068# General Electric Co., Philadelphia, Pa. Missile and Space Div.
INVESTIGATION OF A NON-EQUILIBRIUM MAGNETOHYDRODYNAMIC GENERATOR Annual Report, 1 Aug. 1971 - 31 Jul. 1972

Bert Zauderer 31 Jul. 1972 37 p refs
(Contract N00014-70-C-0321; NR Proj. 9800)
(AD-747661) Avail: NTIS CSCL 10/2

The completion of a detailed study of electrode conduction led to the selection of thermionically emitting, cesiated tungsten as the most desirable cathode material for closed cycle, MHD generators. It was also found that with a high cesium ion flux at the cathode, electrode currents considerably higher than thermionic levels could be obtained. Finally, it was shown that the cold aerodynamic boundary layer was a major contributor to the electrode losses. Measurements of the gas dynamic performance of the MHD generator under a wide range of load conditions showed good agreement with the MHD generator theory. For the first time anywhere, 8.5% heat to electric conversion was obtained in the MHD generator at 2100 K in cesium seeded neon. Based on the above results, a new MHD system consisting of a longer and larger MHD channel and a magnet which was three times more powerful than the previous one was constructed and installed in the shock tunnel facility.

N73-12784# Comitato Nazionale per l'Energia Nucleare, Rome (Italy).

STATUS OF THE RESEARCH ON CLOSED CYCLE MHD POWER GENERATION

E. Bertolini, R. Toschi, and V. Zampaglione 17 Dec. 1971 39 p refs
(RT/ING-71120) Avail: AEC Depository Libraries

A complete survey of the status of the research and of the potentialities of the nuclear MHD system to convert heat into electricity is presented. The results are reported for both experiments and theories concerning the MHD generator and the studies on high-temperature nuclear reactors. The most

significant results in system analysis studies and in the power generation experiments are presented. A critical analysis is made concerning the main mechanisms, still under study, which are responsible for reductions in the generator performances when compared with the ideal behavior and the scaling laws used so far to extrapolate the present size experimental results for power plant of 1,000 MW(t) or even more. Author (NSA)

N73-12785# Atomic Energy Commission, Oak Ridge, Tenn. Technical Information Center.

CONTROLLED FUSION AND PLASMA RESEARCH: A LITERATURE SEARCH

Milton O. Whitson, comp. Jan. 1972 483 p refs
(TID-3557-1971-Suppl) Avail: NTIS

A bibliography is presented with 2905 references on various aspects of plasma physics and controlled thermonuclear research. Report number, corporate author, and subject indexes are included. Author (NSA)

N73-12800# Florida Univ., Gainesville. Dept. of Nuclear Engineering Sciences.

NUCLEAR GENERATED PLASMAS Final Summary Technical Report, 1 May 1965 - 30 Jun. 1971

William H. Ellis 8 Sep. 1971 408 p refs
(Contracts NOnr-580(18); N00014-68-A-0173-0009; NR Proj. 099-382)
(AD-747681) Avail: NTIS CSCL 20/9

The report presents a survey of the research activities of a Graduate Research program in the area of nuclear generation of plasmas for potential application to MHD electrical power generation from nuclear energy sources. Described are the development of a new plasma diagnostic tool, the Pulsed Ionization Chamber (PIC), its application to plasma kinetic measurements in high pressure gases of the type and in the pressure range used for nuclear reactor coolants and MHD working media, and to wide-range neutron flux and reactor power measurements (over a range of 10 orders of magnitude). Author (GRA)

N73-13056# Army Foreign Science and Technology Center, Charlottesville, Va.

FUEL CELLS AND PROSPECTS FOR THEIR USE IN RAILROAD TRANSPORTATION

V. M. Anisimov 13 Jul. 1972 74 p refs Transl. into ENGLISH of the book "Toplivo. Elementy i Perspekt. Primeneniya ikh na Zheleznodorozhnom Transp." Moscow, Izd. Transp., 1971
(AD-747512; FSTC-HT-23-960-72) Avail: NTIS CSCL 10/2

The principles of the direct conversion of chemical energy into electrical energy are examined. Different types of fuel cells are described and existing power plants and power plants with fuel cells are compared. Author (GRA)

N73-13061# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PRINCIPLES OF THERMOELECTRONIC AND MAGNETO-HYDRODYNAMIC CONVERSION OF ENERGY

K. M. Arefev and I. I. Pakev 2 Jun. 1972 306 p refs Transl. into ENGLISH from the monograph "Osnovy Termoelektronnogo i Magnitogidrodinamicheskogo Preobrazovaniya energii" Moscow, 1970 p 1-215
(AD-748707; FTD-MT-24-1464-71) Avail: NTIS CSCL 10/2

The report deals with the basic physical processes in thermionic and magnetohydrodynamic converters of thermal energy into electrical energy. Data on the operation of the converters are given. The book is intended for engineers and can be used as a textbook by students of technical colleges. Author (GRA)

N73-13865* Tennessee Univ., Tullahoma. Space Institute.
CONTRIBUTIONS FROM SPACE TECHNOLOGY TO CENTRAL POWER GENERATION

John B. Dicks, Jr. In NASA. Marshall Space Flight Center

Space for Mankind's Benefit 1972 p 361-368 refs (For availability see N73-13829 04-30)
(Contracts F44620-69-C-0031; DI-14-32-0001-1213)
CSCL 10B

The proceedings of a space congress held at Huntsville, Alabama during November 1971 are presented. The theme of the conference was Space for Mankind's Benefit. The subjects discussed were: (1) man in near-earth space, (2) fundamental benefits of the space program, (3) benefits of orbital surveys and space technology to environmental protection, (4) benefits to telecommunications, navigation and information systems, (5) benefits to future power generations and energy production, and (6) general technology utilization in the public sector. For individual titles, see N73-13830 through N73-13874.

N73-14746# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.

EXPERIMENTAL INVESTIGATIONS OF AN OPEN-CYCLE, VORTEX MHD GENERATOR

George J. Conroy, Roy Kurtzrock, C. Richard B. Snedden, Joseph J. Demeter, Daniel Bienstock, and William F. Hughes (Carnegie-Mellon Univ.) 1972 31 p refs
(BM-R1-7699) Avail: NTIS HC \$3.75

Electrical power generation was studied in a laboratory scale, open-cycle vortex MHD generator, which offers several advantages over straight channel generators that require separate combustors. Compactness, lower capital cost, and high energy release are obtained by combining the combustor and generator into one unit in the vortex generator. In addition, the vortex generator uses a simple solenoid rather than the more complex and expensive saddle magnet required for straight channel generators. The primary motivation for this experimental device in terms of ultimate objective was to investigate the vortex generator with applications to direct coal firing and with combustion taking place in specially designed expansion nozzles. The vortex device offers one decided advantage over the linear device in this regard because slag deposits do not degrade or short-circuit the coaxial electrodes as is the case for a linear machine. Power was obtained by impressing an axial field of 3,000 G from an air core solenoid magnet. Tests were conducted by seeding natural gas seeded with potassium acetate and burning with preheated oxygen enriched air. Power generation was lower than calculated because theoretical plasma velocities were not achieved. Author

N73-15757# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

GENERAL INVESTIGATION AND PARAMETRIC STUDY OF INDUCTIVE MHD CONVERTERS INCLUDING DESIGN AND DEVELOPMENT OF A CRYOGENICALLY COOLED EXPERIMENTAL 4 KW CONVERTER [ALLGEMEINE THEORETISCHE UNTERSUCHUNGEN UND PARAMETRISCHE STUDIEN UEBER INDUKTIVE MHD-WANDLER SOWIE ENTWICKLUNG UND KONSTRUKTION EINES KRYOGEN GEKUEHLTEN 4-KW-WANDLERS FUEER VERSUCHSZWECKE]

Constantin Carpetis and Andreas Gann Apr. 1971 274 p refs In GERMAN; ENGLISH summary
(DLR-FB-71-74) Avail: NTIS HC \$15.75; DFVLR, Porz, West Ger. 80,30 DM

The problems anticipated in calculation and construction of inductive MHD-converters in the power range of a few kilowatts to 50 megawatts are discussed. Detailed analyses for an experimental 4 kW-converter with a cryogenically-cooled winding system are presented. The importance of the major loss mechanisms (channel wall eddy losses, flow friction and skin effect where cryogenic cooling is used), the actual construction problems and the power limits of such converters are stressed. Author (ESRO)

N73-16036# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE ENIN-2 EXPERIMENTAL OPEN CYCLE MHD GENERATOR RIG

D. G. Zhimerin, V. A. Bashilov, and V. P. Motulevich 25 Aug. 1972 15 p Transl. into ENGLISH from MHD Symp. (Warsaw), v. 1, 1968 p 2821-2829
(AF Proj. G101)

(AD-751251; FTD-HT-23-559-72) Avail: NTIS CSCL 10/2

An experimental rig has been set up to study the processes taking place in the duct of an open-cycle MHD generator. The installation consists of a combustion chamber unit in which natural gas is oxidized in an air atmosphere enriched with oxygen (to pure O₂) with ionizing seeds of different types. The pressure in the duct can go up to 50 atm and the temperature to 3500K. Both the oxygen and the gas are collected in containers of 14 and 3.5 tons capacity, respectively. As the combustion products pass into the duct, the nozzle system can vary the Mach number from subsonic to approximately 3. The duct has a rectangular cross-section. Author (GRA)

N73-16636 Cornell Univ., New York.

THE DESIGN, MODELING, AND OPTIMIZATION OF A SPACE ORIENTED RADIOISOTOPE THERMOELECTRIC POWER SUPPLY Ph.D. Thesis

Alan Weg Schorr 1971 103 p
Avail: Univ. Microfilms Order No. 72-9935

The design, modeling, and optimization of a radioisotope fueled thermoelectric generator is carried out analytically to obtain the lowest weight, highest efficiency generator. The generator has basically a cylindrical configuration and is designed to operate in space and provide on the order of a hundred watts of electric power. Thermocouples are placed cylindrically about the fuel capsule and are heated by radiation alone. The equations describing the thermal-electric model of the generator and fuel capsule are developed. The entire system is optimized using the method of constrained steepest descent to minimize the function $f = S_2 (1/\text{specific power}) + S_3 (1/\text{efficiency})$. Results of the optimization have yielded generators with performance increases of 15 percent in efficiency and of 26 percent in specific power over the General Electric baseline design. The maximum design efficiency obtained is 9.5 percent and the maximum specific power is 4.06 watts/pound for the constraints considered. Dissert. Abstr.

N73-16687# Joint Publications Research Service, Arlington, Va.

MAGNETOHYDRODYNAMIC METHOD OF PRODUCING ELECTRICAL ENERGY, PART 1

V. A. Kirillin, ed. and A. Ye. Sheyndlin, ed. 9 Jan. 1973 207 p refs Transl. into ENGLISH of the book "Magnitogidrodinamicheskiy Metod Polucheniya Elektroenergii" Moscow, Energiya, 1972 360 p
(JPRS-57940-1-Pt-1) Avail: NTIS HC \$12.50

A collection of articles on magnetohydrodynamic energy generation is presented. The topics discussed are: (1) the theory and calculation of flows in a MHD generator operating on an equilibrium plasma, (2) experimental investigation of open-cycle MHD generators, (3) investigations of the physical processes and diagnostics in open- and closed-cycle MHD generators, (4) investigations of the basic equipment of MHD generators, (5) investigations of circuits and cycles of power stations with MHD generators, (6) liquid-metal MHD plants, and (7) material for MHD generators. Author

N73-16688# Joint Publications Research Service, Arlington, Va.

MAGNETOHYDRODYNAMIC METHOD OF PRODUCING ELECTRICAL ENERGY, PART 2

V. A. Kirillin, ed. and A. Ye. Sheyndlin, ed. 9 Jan. 1973 209 p refs Transl. into ENGLISH of the book "Magnitogidrodinamicheskiy Metod Polucheniya Elektroenergii" Moscow, Energiya, 1972 360 p
(JPRS-57940-2-Pt-2) Avail: NTIS HC \$12.50

A collection of articles on magnetohydrodynamic energy generation is presented. The topics discussed are: (1) the theory and calculation of flows in a MHD generator operating on an

05 ENERGY CONVERSION

equilibrium plasma, (2) experimental investigation of open-cycle MHD generators, (3) investigations of the physical processes and diagnostics in open- and closed-cycle MHD generators, (4) investigations of the basic equipment of MHD generators, (5) investigations of circuits and cycles of power stations with MHD generators, (6) liquid-metal MHD plants, and (7) material for MHD generators. Author

N73-16718# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HYDRAULICS OF MAGNETOHYDRODYNAMIC MACHINES
A. V. Tananev 1 Sep. 1972 299 p refs Transl. into ENGLISH of the book "Gidravlika Magnitogidrodinam. Mashin." Moscow, 1970 p 1-271
(AD-751465; FTD-MT-24-2001-71) Avail: NTIS CSCL 20/9

Magnetohydrodynamic machines are examined from the subject of hydraulics. Familiar studies on the motion of viscous incompressible fluid in pipes and in the boundary layer, including flows in the presence of a magnetic field, are generalized with respect to the flows in the circulatory system of magnetohydrodynamic (MHD) machines. Methods of calculating these flows are stated. New results of theoretical and experimental studies on the hydraulic properties of linear MHD machines are given.

Author (GRA)

N73-18090# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ANALYSIS OF THERMAL ECONOMY OF COMBINED POWER INSTALLATIONS EMPLOYING OPEN-CYCLE MHD GENERATORS

L. S. Popyrin, N. N. Pshenichnov, and A. M. Roshchin 27 Oct. 1972 28 p refs Transl. into ENGLISH from MHD Symp. (Warsaw), v. 5, 1968 p 2893-2916
(AD-753031; FTD-HT-23-593-72) Avail: NTIS CSCL 10/2

A mathematical model was used to analyze the thermodynamic efficiency of combined power plants incorporating MHD generators. The mathematical model devised by the authors consists of three parts. The first part is designed to describe processes determining the physical parameters of the working media used. The second part describes processes associated with the conversion and transfer of energy in different elements of the installation, including the MHD generator. The third part is a complex model of an actual power plant (including oxygen enrichment of the oxidant.) When the mathematical model was being designed, actual technical restrictions were taken into account, i.e., the extent to which the parameters could be varied, and some of the technological characteristics of the installation.

Author (GRA)

N73-19051 Politecnico di Milano (Italy). Ist. di Macchine.
A METHOD FOR PRELIMINARY ANALYSIS OF MHD GENERATOR PERFORMANCE
C. Casci, A. Coghe, and U. Ghazzi In AGARD Energetics for Aircraft Auxiliary Power Systems Feb. 1972 12 p refs

The characteristics of magnetohydrodynamic generators for aircraft and spacecraft applications are discussed. A method for analyzing the parameters of a magnetohydrodynamic generator is developed. The analysis is obtained by fixing the total enthalpic difference between the inlet and outlet sections of the duct and by examining the various possibilities through which such a condition may be achieved. Thermodynamic and electromagnetic quantities are studied in relation to the velocity difference between the inlet and outlet sections of the duct and by some other parameters, such as expansion ratio and form factor of the duct.

Author

N73-20931*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
SOLID MEDIUM THERMAL ENGINE Patent Application
James R. Jedlicka, Le Roy, Guist, and Richard M. Beam, inventors

(to NASA) Filed 27 Feb. 1973 25 p
(NASA-Case-ARC-10461-1; US-Patent-Appl-SN-336319) Avail: NTIS HC \$3.25 CSCL 20M

A thermal engine using a single phase metallic working substance to convert thermal energy directly into mechanical energy is presented. The preferred embodiment of the invention includes a single phase working substance in the form of a cylindrical metallic tube free to rotate about its axis while being subjected to continuous bending moments stressing the body along its axis. The stressing subjects the upper portions of the tube to compression while placing the lower portions under tension as the tube is caused to rotate about its axis. Means are also provided for positioning the tube so that radiant energy is concentrated on that portion of the tube which is under maximum compression. The result is that heat absorbed by this portion causes an imbalance of internal forces which tend to impart a rotational moment to the tube so that it rotates about its axis. NASA

N73-22168# Army Electronics Command, Fort Monmouth, N.J.
ELECTROMECHANICAL ENERGY CONVERSION DEVICES UTILIZING BOTH CONVENTIONAL AND RARE EARTH COBALT PERMANENT MAGNET MATERIALS

R. L. Ross, O. J. Iafrate, and F. Rothwarf Dec. 1972 28 p refs

(DA Proj. 1TO-61102-B-11A)

(AD-756433; ECOM-4064) Avail: NTIS CSCL 09/1

The recent development of the high coercivity, rare-earth alloys such as cobalt-samarium and cobalt-cerium represents a major advance in the field of applied magnetism. The unique properties of these materials promise to revolutionize the design of devices employing permanent magnets. However, as with all new advances in material science, criteria must be established to effectively incorporate the inherent advantages existent within these new materials. Consequently, certain device configurations are not conducive to the incorporation of the new rare-earth cobalt materials. Such a limitation is illustrated in the first design considered: the flux modulation generator which employs conventional Alnico material. The second design discussed in detail is the moving-coil generator employing Co5Sn or Co5Ce material. Both devices may be used to convert mechanical motion into electrical energy and are applicable to improving the power output of existing fluidic generators used to power artillery and rocket fuzing systems. Theoretical predictions are given and alternator configurations are suggested for improving generator performance. Author (GRA)

N73-22662*# Scientific Translation Service, Santa Barbara, Calif.
APPLIED MAGNETOHYDRODYNAMICS, REPORT NO. 10, MHD-TEST FACILITY ARGAS 2: DESCRIPTION AND OPERATIONS

T. Bohn, K. Grawatsch, P. Komarek, H. Lang, and G. Noack Washington NASA May 1973 92 p refs Transl. into ENGLISH from Kernforschungsanlage Julich Ges. mit Beschränkter Haftung. (West Germany) report no. Jul-883-TP, Aug. 1972 p 87 (Contract NASw-2483)

(NASA-TT-F-14876; Jul-883-TP) Avail: NTIS HC \$6.75 CSCL 20I

The enlargement of the Argas 2 facility to provide for the use of a superconducting magnet is described including the experimentation zone with nozzle, channel, diffuser, superconducting magnet, and the seed material circuit. Problems occurring during operation are discussed and the cesium circuit is analyzed. F.O.S.

N73-22702# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SUPERCONDUCTORS IN MARINE TECHNOLOGY

Vladimir B. Zenkevich, Efim Ya. Kazovskii, Mark G. Kremlev, Parvovai V. Orlov, Vyacheslav V. Sychev, Mikhail I. Fedosov, and Valentin N. Shakhartarin 6 Dec. 1972 399 p refs Transl. into ENGLISH of the book "Sverkyprovodniki v Sudonoi Tekh."

1971 p 1-256

(AF Proj. 3145)

(AD-755711; FTD-HC-23-738-72) Avail: NTIS CSCL 20/3

Contents: The nature of superconductors; Materials for superconductive coils; Superconductive solenoids; Superconductive magnetic systems for magnetohydrodynamic transformers; Superconductive magnetic systems for transformers and generators; The use of superconductors in instruments and systems of navigation and steering; Current leads and feed systems for superconductive devices; Cryogenic technology.

GRA

N73-22912# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.

CLEAN AND ATTRACTIVE URBAN POWER SYSTEMS

James T. Yen Aug. 1972 36 p refs Presented at the Intersociety Energy Conservation Eng. Conf., San Diego, Calif., 25-29 Sep. 1972

(RE-439J) Avail: NTIS HC \$4.00

The siting and waste problems facing the power industry at the present time are examined. It is proposed that these problems be resolved by integrating clean power plants into community centers. This can be done in such a way that not only power but also year-round recreation and job-training will be enjoyed and utilized by the residents. More specifically, the result is a new type of integrated system that is comprised of total energy gas turbine power plants to be located in underground sites within the community centers, and year-round recreation, job-training, and other facilities to be designed to suit local needs and to be located within the same community centers. Author

N73-23757# Technische Hogeschool, Eindhoven (Netherlands). Groep Direkte Omzetting.

CONDUCTING GRIDS TO STABILIZED MHD GENERATOR PLASMAS AGAINST IONIZATION INSTABILITIES

A. Veeffkind Sep. 1972 21 p refs

(TH-72-E-31; ISBN-90-6144-031-9) Avail: NTIS HC \$3.25

Ionization instabilities in MHD generators may be suppressed by the use of grids that short circuit the ac electric field component corresponding to the direction of maximum growth. An analysis of the influence of the corresponding boundary conditions has been performed in order to obtain more quantitative information about the stabilizing effect of this system. Author

N73-23765# Avco-Everett Research Lab., Everett, Mass.

EXPERIMENTAL AND ANALYTICAL RESEARCH ON A TWO MEGAWATT, HIGH PERFORMANCE MHD GENERATOR

Interim Report, 1 Apr. 1971 - 1 Oct. 1972

O. K. Sonju and J. Teno Oct. 1972 341 p refs

(Contract F33615-71-C-1456; AF Proj. 3145)

(AD-756489; AFAPL-TR-72-98) Avail: NTIS CSCL 10/2

The report presents the initial results of a combined analytical and experimental program whose broad objectives are to achieve a more complete understanding of the operation and appropriate design techniques of compact high-performance MHD generators by further establishing the detailed analytical basis of the performance of these generators and to demonstrate the feasibility of operating compact high-performance MHD generators under a repetitively pulsed mode of operation at high power levels in this case at the 2 MW level. In particular, the results of studies of stability, and effects, transient response, diagnostic, rapid startup, channel voltage breakdown and performance optimization are discussed and summarized. A parallel effort under this program has been directed to constructing a generator test facility and designing and fabricating a 2 MW high-performance MHD generator system to be used in the test facility. Author (GRA)

N73-25102# Bureau of Mines, Washington, D.C.

ECONOMICS OF MIXED POTASSIUM-CESIUM SEEDING OF AN MHD COMBUSTION PLASMA

P. D. Bergman and D. Bienstock Dec. 1972 17 p refs

(PB-214314/7; BM-RI-7717) Avail: NTIS HC \$3.00 CSCL 10B

The proposed use of cesium seeded combustion plasmas for open-cycle MHD power generation has attracted considerable interest. Cesium-seeded combustion plasma exhibits a greater electrical conductivity than a potassium-seeded combustion plasma. However, there are drawbacks to cesium seeding such as: the need to use low sulfur coal because of cesium's inability to effectively remove SO₂ from the combustion products; the high cost of the cesium ore, pollucite; and cesium's limited availability. Thus, the report looks at the alternative of using a mixture of both potassium and cesium for seeding to overcome these problems. Costs and techniques are also briefly discussed.

GRA

N73-25106# Systems Research Labs., Inc., Dayton, Ohio.

CONSTRUCTION AND TEST OF AN MHD GENERATOR CHANNEL AND ELECTRICAL POWER CONVERTER

Technical Report, 1 Feb. 1971 - 28 Feb. 1972

R. Nimmo, L. Buechler, and K. Irish Nov. 1972 166 p refs

(Contract F33615-71-C-1425; AF Proj. 3145)

(AD-758783; AFAPL-TR-73-5) Avail: NTIS CSCL 10/2

The AFAPL MHD Facility was placed in operation. A peg wall, diagonally connected MHD channel was constructed, making use of materials evaluated in a Hall channel. Seed handling procedures, a new seeding wheel, and timing relations for the burner, fuel flow, oxygen flow, and seed injection were developed. A series of conductivity tests were conducted, and a conductivity of 10 mho's per meter was established. The MHD generator was run at an output of 800 volts, 125 kW with a 2.2 Tesla magnetic field strength. A 2000 Hz converter was designed, constructed and tested to convert a 600 volts dc input to a 50,000 volts ac output. The MHD generator was operated successfully with the new channel for 15 runs of 4 to 6 seconds each, with no appreciable deterioration of the MHD channel or support equipment.

Author (GRA)

N73-26045# Computer Sciences Corp., Falls Church, Va.

FUEL CELLS: A SURVEY

Bernard J. Crowe Washington NASA 1973 112 p refs

(Contract NASw-2173)

(NASA-SP-5115; LC-72-600266) Avail: NTIS MF \$1.45; SOD

HC \$0.85 Domestic Postpaid or \$0.60 GPO Bookstore CSCL 10A

A survey of fuel cell technology and applications is presented. The operating principles, performance capabilities, and limitations of fuel cells are discussed. Diagrams of fuel cell construction and operating characteristics are provided. Photographs of typical installations are included.

Author

N73-28655* Georgia Inst. of Tech., Atlanta.

MHD GENERATOR PERFORMANCE LIMITATIONS

R. J. Rosa In its Satellite Nucl. Power Station: An Eng. Anal.

Mar. 1973 p 23-28

CSCL 18E

The electrical properties of the gas are the primary limiting factor to MHD generator performance; the most relevant electrical properties are the conductivity and the Hall parameter. The maximum allowable pressure at several given levels of power extraction vs. temperature is represented graphically. J.A.M.

N73-28657* Georgia Inst. of Tech., Atlanta.

POWER PLANT SYSTEMS ANALYSIS

J. R. Williams and Y. Y. Yang In its Satellite Nucl. Power

Station: An Eng. Anal. Mar. 1973 p 63-118

CSCL 18E

Three basic thermodynamic cycles of advanced nuclear MHD power plant systems are studied. The effect of reactor exit temperature and space radiator temperature on the overall thermal

05 ENERGY CONVERSION

efficiency of a regenerative turbine compressor power plant system is shown. The effect of MHD pressure ratio on plant efficiency is also described, along with the dependence of MHD power output, compressor power requirement, turbine power output, mass flow rate of H₂, and overall plant efficiency on the reactor exit temperature for a specific configuration. J.A.M.

N73-30699# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Technische Physik.

APPLIED MAGNETOHYDRODYNAMICS. VOLUME 11: OUTLOOK AND POSSIBILITY FOR MHD GAS COMBUSTION GENERATORS WITH AIR TURBINE FOR NUCLEAR PLANT APPLICATION IN THE BRD

G. Noack Oct. 1972 155 p refs In GERMAN (JUL-892-TP-Vol-11) Avail: AEC Depository Libraries \$9.75

Based on the present and on the projected energy needs of West Germany, MHD generators with gas fuel are analyzed. The analysis considers natural gas and air enriched with oxygen to obtain the high temperatures required by the MHD generator. Data about high flame temperatures are listed and discussed in detail. Under the conditions prevailing in West Germany, the best arrangement is offered by an MHD generator with subsequent air turbine. The design of such an arrangement is discussed thoroughly from the technical as well as the structural point of view. NSA

N73-30890# Hercules, Inc., Magna, Utah. Bacchus Works. **EXPLOSIVE MAGNETOHYDRODYNAMIC PROGRAM**

Technical Report 2 Jan. - 1 Oct. 1972
C. D. Bangert, L. R. West, T. R. Brogan, D. B. Sheldon, and Z. Stekly May 1973 256 p refs
(Contract F33615-72-C-1394; ARPA Order 2357; AF Proj. 3145)

(AD-762934; H500-12-3-1; AFAPL-TR-73-16) Avail: NTIS CSCL 10/2

The report is basically an analytic study with the addition of design and experimental data required to augment the study. The analysis presented is conclusive in its finding that the X-MHD is a highly versatile prime power source which can be operated without benefit of vacuum equipment in residual ambient pressure gases of various composition and at high repetition rate with various loads. At high repetition rate, the spent explosion products of a previous round are an ideal residual or purge gas. Energy conversion efficiency in excess of 10% should be attainable with optimized residual gases at ambient pressure, and 5-10% with spent explosion product residual gases at field levels currently achievable with superconducting magnets. (Modified author abstract) GRA

N73-30979# Engelhard Minerals and Chemicals Corp., Newark, N.J. Systems Dept.

OPEN CYCLE FUEL CELL POWER PLANT DIRECT CURRENTS, 1.5 KW Final Technical Report on phase 1, 1 Jul. 1970 - 30 Jun. 1971

O. J. Adhart, M. F. Collins, R. Michalek, and P. L. Terry Jul. 1973 126 p refs
(Contract DAAK02-70-C-0517)

(AD-764285; SO-70-470-FR) Avail: NTIS CSCL 10/2

The report describes the design of an advanced development model of a portable field electrical power source capable of operation on logistic military fuels. The design was based on and substantiated by full size breadboard testing conducted concurrent with the design effort. The design of the 1.5 KW power plant was verified by the operation of a full scale breadboard system consisting of thermal cracker, fuel cell, and control module. The power conditioner was not tested in breadboard form. The switching transistor and drive circuitry, however, were tested on fuel cell output. Full scale breadboard testing of the integrated system was limited to 21 hours during which the system produced 1.25 KW at a fuel rate of 2.5 lbs/hr of JP-4. (Modified author abstract) GRA

N73-31848# Army Foreign Science and Technology Center, Charlottesville, Va.

DEVELOPMENT AND INVESTIGATION OF HIGH TEMPERATURE COMBUSTOR TO BE USED FOR A SOLID FUEL MHD GENERATOR AND THERMODYNAMIC ANALYSIS OF COMBUSTION CONDITIONS

S. A. Tager 13 Mar. 1973 16 p refs Transl. into ENGLISH from the publ. "5th International Conference on MHD Analysis of Combustion Conditions" Munich, Apr. 1971 15 p (AD-764153; FSTC-HT-23-2007-72) Avail: NTIS

The basic principles of the high-temperature combustion of natural solid fuel are formulated. Variants are optimized; the scheme of a vertical cyclone with lower gas discharge, hardened slag lining protection of walls, and side removal of slag was adopted. Complete preliminary mixing of dry coal dust with all the high-temperature heated air and uniformly distributed feed of a ready dust-air mixture along the entire cyclone perimeter were carried out. A revised method of calculating high-temperature regimes for the combustion of solid fuel is presented that takes into account the actual operating conditions of the combustion chamber. The maximum attainable temperatures in the combustion of natural fuel were estimated. The combustion chamber, methods and conditions of the experiments are described. (Modified author abstract) GRA

N73-31991*# Techtran Corp., Glen Burnie, Md.

CALCULATION AND COMPARISON OF THE ECONOMICS OF ELECTROCHEMICAL FUEL CELLS

F. A. Pohl, J. Boehm, and H. Carl Washington NASA Oct. 1973 17 p refs Transl. into ENGLISH from Wiss. Ber. AEG-Telefunken (West Germany), v. 45, no. 3, 1972 p 141-146

(Contract NASw-2485)

(NASA-TT-F-15147) Avail: NTIS HC \$3.00 CSCL 10A

The economic benefits are considered to be derived from various types of electrochemical fuel cells. It is found that the tungsten carbide-carbon cell is most economic in the low temperature fuel cell range, and that high fuel costs are more significant than high investment costs. Author

N73-31996# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

MAGNETOHYDRODYNAMIC GENERATOR FOR A COMBINED MAGNETOHYDRODYNAMIC ELECTRIC POWER PLANT WITH A FIRST GENERATION OPEN CYCLE

B. Ya. Shumyatskii, M. G. Koryagina, P. P. Ivanov, and V. I. Kovbasyuk 31 Jul. 1973 28 p refs Transl. into ENGLISH from unidentified Russian monograph

(AF Proj. 3145)

(AD-764925; FTD-MT-24-713-73) Avail: NTIS CSCL 10/2

Contents: Preliminary analysis of the best magnetic systems; Variation problem in the technical and economical optimization of an MHD generator; Characteristics of optimum MHD generators. GRA

N73-32109* Catholic Univ. of America, Washington, D.C.

ELECTROMAGNETIC WAVE ENERGY CONVERTER Patent

Robert L. Bailey, inventor (to NASA) Issued 18 Sep. 1973 7 p Filed 27 Sep. 1972 Supersedes N73-11205 (11 - 02, p 0149) Sponsored by NASA

(NASA-Case-GSC-11394-1; US-Patent-3,760,257;

US-Patent-Appl-SN-292698; US-Patent-Class-321.1.5;

US-Patent-Class-136-89; US-Patent-Class-250-212) Avail: US Patent Office CSCL 10A

Electromagnetic wave energy is converted into electric power with an array of mutually insulated electromagnetic wave absorber elements each responsive to an electric field component of the wave as it impinges thereon. Each element includes a portion tapered in the direction of wave propagation to provide a relatively wideband response spectrum. Each element includes an output for deriving a voltage replica of the electric field variations intercepted by it. Adjacent elements are positioned relative to

each other so that an electric field subsists between adjacent elements in response to the impinging wave. The electric field results in a voltage difference between adjacent elements that is fed to a rectifier to derive dc output power.

Official Gazette of the U.S. Patent Office

N73-33009# Naval Ship Research and Development Center, Annapolis, Md.

HIGH-POWER DENSITY HYDRAZINE FUEL CELLS

D. E. Icenhower and H. B. Urbach Jun. 1973 17 p refs

(SF35431005)

(AD-764530; NSRDC-3934; NSRDC-27-381) Avail: NTIS CSCL 10/2

A hydrazine-oxygen fuel cell was operated under moderate conditions of temperature and concentration at power densities up to 600 watts per square foot (1000 amperes per square foot at 0.6 volt). At this output, a power efficiency of 32% was obtained at 70C at less than molar hydrazine concentration. Power efficiencies exceeding 48% were obtained over a power density range from 40 to 200 watts per square foot by matching the temperature and hydrazine concentration optimally to the electrical load. The three major components of cell polarization were examined. Critical resistance losses were minimized by use of a 0.010-inch asbestos matrix which was more than adequate to prevent leakage of oxygen to the anode at moderate differential pressures. A projected cell thickness of 0.1 inch and a power density of 200 watts per square foot correspond to a calculated stack power-volume ratio of 16 kilowatts per cubic foot. (Modified author abstract) GRA

06 ENERGY TRANSPORT, TRANSMISSION, DISTRIBUTION

Includes technological or economic viewpoints in the transport of fuels; transport by pipes, tubes, etc.; microwave transmission; laser transmission.

A71-36202 Transformation, transport and accumulation of energy in hydrostatic power transmission systems (Transformation, Transport und Speicherung von Energie in hydrostatischen Energieübertragungen). W. M. J. Schlösser. In: Development of fluid power transmissions and control systems; Verein Deutscher Maschinenbau-Anstalten and Deutsche Messe- und Ausstellungen, Conference on Oil Hydraulics and Pneumatics, Hanover, West Germany, April 26, 27, 1971, Conference Report Volume (Entwicklung fluidischer Antriebe und Steuerungen; Verein Deutscher Maschinenbau-Anstalten und Deutsche Messe- und Ausstellungen, Fachtagung über Ölhydraulik und Pneumatik, Hanover, West Germany, April 26, 27, 1971, Tagungsberichtsband).

Hanover, Deutsche Messe- und Ausstellungs-AG, 1971, p. 9-30. 26 refs. In German.

An attempt is made to break down hydrostatic power transmission systems into groups using different mechanisms of power transformation, transport and accumulation, such as mechanical, electrical, pneumatic and hydraulic power carriers. A graphical representation of this classification is given. Special attention is given to the high pressure processes used in these systems. The study is designed to provide the designer with a means for selecting the desirable information from a large volume of available data. Mass, heat, optical, chemical, mechanical, electrical, pneumatic and hydraulic energies are covered. V.Z.

A72-35328 * # Laser power stations in orbit. C. F. Hansen and G. Lee (NASA, Ames Research Center, Physical Gasdynamics and Lasers Branch, Moffett Field, Calif.). *Astronautics and Aeronautics*, vol. 10, July 1972, p. 42-55. 52 refs.

Potential laser applications for space-borne power generation are discussed in the light of the current state of the art. The feasible ranges of various laser classes with standing waves are estimated. Power and efficiency, mirror factors, phased-array performance and beam patterns are analyzed as selection characteristics. Other topics include the maximum receiving-element size, energy conversion, pointing and tracking, causes of deformation, and mirror distortions. It is theorized that a nuclear-fueled laser satellite could beam power to distances twice the earth-sun distance with predictable pointing accuracies. V.Z.

A73-22822 * Laser energy transfer - An analytic survey of high power applications. R. D. Arno, J. S. MacKay, and K. Nishioka (NASA, Ames Research Center, Advanced Concepts and Missions Div., Moffett Field, Calif.). In: Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. Washington, D.C., American Chemical Society, 1972, p. 1116-1124. 10 refs.

A73-33183 # A resource carrying aircraft for remote regions. V. H. Atrill. In: Anglo-American Aeronautical Conference, 13th, London, England, June 4-8, 1973, Proceedings. (A73-33176 16-02) London, Royal Aeronautical Society, 1973. 12 p.

Consideration of the possibility of using very large aircraft for the first-leg movement of liquid and gaseous fossil fuels from the Canadian and American Arctic. The known liquid and gaseous fossil

fuel resource situation in the Canadian and American Arctic is briefly summarized, and the pipeline proposals actively being promoted are cited. In view of the heavy expenditures for these pipelines, a very large resource-carrying aircraft for first-leg movements is proposed which has a payload of close to 1200 tons for a mission of 500 nautical miles. It is claimed that these vehicles can operate in the Arctic 18 to 18.5 hours per day. They will cruise at about 400 knots. Their estimated cost is eighty million dollars per aircraft. A.B.K.

N68-14618 Lockheed Missiles and Space Co., Sunnyvale, Calif. **THE THREE-INDEX TRANSPORT PROBLEM**

G. D. Rakhmanin, S. S. Surin, and G. V. Shalabin [1967] 10 p Transl. into ENGLISH from the book "Application of Mathematics to Economics" Leningrad, Leningrad Univ. Press, 1965 p 124-133

An algorithm is developed for the transport and storage problem in the petroleum industry for the optimal location of the industry in a geographic region. The stages covered are storage at the refinery, transport to the distributor, storage at the distributor's, and transport to the consumer. For a short-range planning problem, only the current expenditures are considered. For long-range planning the capital expenditures at storage and refinery areas and in the transport are also included. N.E.N.

N69-27096# Commissariat à l'Energie Atomique, Paris (France). **TECHNICAL ASPECTS AND ECONOMIC INCIDENTS OF TRANSPORTATION IN THE FUEL CYCLE [ASPECTS TECHNIQUES ET INCIDENCES ECONOMIQUES DES TRANSPORTS DANS LE CYCLE DES COMBUSTIBLES]**

Y. Sousselier and M. Labrousse [1968] 21 p refs In FRENCH Presented at the Symp. on Econ. on Nucl. Fuels, Gottwaldov, Czech., 27 May 1968

(CEA-CONF-1093; CONF-680541-1) Avail: AEC Depository Libraries

The power reactor fuel cycle is discussed from the French point of view. Areas of U loss during processing and reprocessing are listed. Safety and economic aspects are discussed. Methods of fuel and spent fuel transportation used for semidefinite Chinon reactors and Bugey Power Reactor are described; the advantages of using Pb shielded casks are considered. Costs of transporting spent natural U fuel are detailed; cost breakdowns are given for France. Transportation costs for $UO_2(NO_3)_2$, Pu, and enriched U are considered briefly. Total fuel cycle costs for a gas-cooled graphite reactor are considered. NSA

N69-37570# Oak Ridge National Lab., Tenn.

SAFETY STUDIES OF FUEL TRANSPORT

In its Chem. Technol. Div. Sep. 1968 p 249 255 refs

Avail: CFSTI

Criteria to provide a series of cask design standards and specifications which, if followed, should insure adherence to requirements set forth in Atomic Energy Commission regulations are under development. Suitable engineering standards are to be established for the design, fabrication, and inspection of irradiated-fuel shipping casks; these will provide information on structural integrity, shielding, heat transfer, criticality, materials of construction, and fabrication techniques. Specification and standards presented are to be based on data from experiments and analyses. Approximately 85% of the criteria have been documented. A.C.R.

N70-10537# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.

THE SPREAD OF OIL SLICKS ON A CALM SEA

James A. Fay Aug. 1969 15 p refs Its Publ. no. 69-6

Avail: CFSTI

06 ENERGY TRANSPORT, TRANSMISSION, DISTRIBUTION

Oil, when spilled on water, tends to spread outward on the water surface in the form of a thin continuous layer. In those instances where this layer is as thin as a wave length of visible light, an iridescent color of the film, caused by light interference, is observed. This tendency to spread is the result of two physical forces: the force of gravity which causes the lighter oil to seek a constant level by spreading horizontally, just as it would on a plane horizontal solid surface, and the surface tension force of pure water, which is usually greater than that of the oil film floating on water. While the oil layer could spread while still remaining intact until it had formed a monomolecular layer, spreading usually stops when the layer is much thicker than this, most likely because of a change in the surface tension properties of the oil. Author

N70-14391# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

SOME CHARACTERISTICS OF THE PROTECTIVE EFFECT OF PETROLEUM SOLUBLE CORROSION INHIBITORS FOR IRON IN THE ELECTROLYTE-HYDROCARBON TWO-PHASE SYSTEM

A. A. Gonik 24 Jul. 1969 10 p refs. Transl. into ENGLISH from the book "Nauchno. Tekhnicheskogo Soveshchaniya po Zashchite c Korrozii Oborudovaniya Neftnykh i Gazovykh Skvazhin" Baku, Izd AN Azerb. SSR, 1964 p 69-80

(AD-694781; FTD-MT-24-20-69) Avail: CFSTI CSCL 13/B

The report concerns certain peculiarities of the protective action of oil-soluble hydrogen-sulfide corrosion inhibitors in the system of hydrocarbon-aqueous acid condensate of oil field gas pipes. Author (TAB)

N70-42226# Naval Research Lab., Washington, D.C. THE REMOTE SENSING OF OIL SLICKS BY RADAR

N. W. Guinard and C. G. Purves 1 Jun. 1970 35 p refs (AD-709982) Avail: NTIS CSCL 13/2

The NRL Four Frequency Radar System, at Coast Guard request, was flown over the oil slick caused by the wreck of the tanker Arrow in the Chedabucto Bay area of Nova Scotia on 17 February 1970. The oil slick was mapped remotely from an EC-121 aircraft in both the horizontal and vertical polarizations. Synthetic aperture imagery was obtained in the P, X, L and C-band. This data clearly established the value of the radar sensing techniques as a tool for locating and monitoring oil spills. Author (TAB)

N71-20975# McDonnell Douglas Astronautics Co., Huntington Beach, Calif.

ELECTRICAL POWER DISTRIBUTION AND USAGE

J. K. Jackson and N. A. Jones In NASA, Langley Res. Center Prelim. Results from an Operational 90-day Manned Test of a Regenerative Life Support System 1971 p 301-312

Avail: NTIS HC\$8.00/MF\$0.95 CSCL 09E

The electrical power subsystem for the 90-day test included 60 Hz, 115 Vac, 1 phase; 400 Hz, 120/208 Vac, 3 phases; and 28 Vdc. Power usage was recorded by watt-hour meters on each 60-Hz circuit, watt meters on each 400-Hz circuit, and ammeters and voltmeters on the dc circuits. Automatic recording of power data was provided by six power sensors on groups of the ac circuits and a shunt in the dc circuits. These signals were recorded on the low-speed data system. Electrical energy usage was 8,169 kWh on the 60-Hz circuits, 5,885 kWh on the 400-Hz circuits, and 2,267 kWh on the dc circuits. The total energy was 16,012 kWh for an average power consumption of 7,425 watts. Power and energy requirements of each unit are presented. Author

N72-23979# RAND Corp., Santa Monica, Calif. THE EFFECT OF FUEL PRICE INCREASES ON ENERGY INTENSIVENESS OF FREIGHT TRANSPORT

W. E. Mooz Dec. 1971 55 p refs (Grant NSF GS-31253) (R-804-NSF) Avail: NTIS HC\$4.75

The use of energy for transporting U.S. intercity freight and the effect of higher fuel price are analyzed. Methods of estimating unit energy consumption are developed and applied to determine average values and trends. Water transport is found to consume an average 500 BTU per ton/mile, rail 750, pipeline 1850, truck 2400, and air cargo 63,000, or 45 times the average for all transport modes in 1968. Only a small shift to air freight, from the present less than 0.2% to 2% of all intercity ton/miles, would double the average unit energy consumption for all freight modes. If present trends continue, this increase will occur by the year 1996. Because of its high fuel consumption, however, air freight growth would tend to be inhibited by higher fuel prices, while surface transport would be little affected. Higher fuel prices may result from shortages, the cost of environmental constraints, new taxes, or other reasons. Author

N73-18981# National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

AIR-CUSHION TANKERS FOR ALASKAN NORTH SLOPE OIL

John L. Anderson Washington Mar. 1973 30 p refs (NASA-TM-X-2683; E-7210) Avail: NTIS HC \$3.00 CSCL 01C

A concept is described for transporting oil from the Arctic to southern markets in 10,000-ton, chemically fueled air-cushion vehicles (ACV's) configured as tankers. Based on preliminary cost estimates the conceptual ACV tanker system as tailored to the transportation of Alaskan North Slope oil could deliver the oil for about the same price per barrel as the proposed trans-Alaska pipeline with only one-third of the capital investment. The report includes the description of the conceptual system and its operation; preliminary cost estimates; an appraisal of ACV tanker development; and a comparison of system costs, versatility, vulnerability, and ecological effect with those of the trans-Alaska pipeline. Author

N73-30484# Massachusetts Inst. of Tech., Cambridge. SOME PROBLEMS AND PROSPECTS FOR MARINE TRANSPORTATION OF OIL IN THE 1970S

Zenon S. Zannetos Mar. 1973 21 p refs Presented at the Energy: Demand, Conserv. and Institutional Probl. Conf., Cambridge, Mass., 12-14 Feb. 1973 (Grant NGL-22-009-309) (NASA-CR-133854; Rept-649-73) Avail: NTIS HC\$3.25 CSCL 05C

The problems associated with, and the financial resources required for ocean transportation of petroleum in the 1970s are discussed in terms of the energy crisis. Spot rate fluctuations for tankers are examined along with the financial requirements for ocean transportation. F.O.S.

N73-33900# New Mexico Univ., Albuquerque. Technology Applications Center.

HEAT PIPE TECHNOLOGY: A BIBLIOGRAPHY WITH ABSTRACTS Cumulative Volume

31 Mar. 1971 239 p refs Sponsored by NASA (NASA-CR-135953; TAC-Bibl-1) Avail: NTIS HC\$14.00 CSCL 20M

A cumulative bibliography on heat pipe research and development projects is presented. The subjects discussed are: (1) general information, (2) heat pipe applications, (3) heat pipe theory, (4) design and fabrication, (5) testing and operation, (6) subject and author index, and (7) heat pipe related patents. Author

N73-33901# New Mexico Univ., Albuquerque. Technology Applications Center.

HEAT PIPE TECHNOLOGY Quarterly Update, 1 Jan. - 31 Mar. 1972

31 Mar. 1972 26 p refs Sponsored by NASA
(NASA-CR-135956; TAC-BIBL-1(72/1)) Avail: NTIS HC
\$3.50 CSCL 20M

A bibliography of heat pipe technology to provide a summary of research projects conducted on heat pipes is presented. The subjects discussed are: (1) heat pipe applications, (2) heat pipe theory, (3) design and fabrication, (4) testing and operation, (5) subject and author index, and (6) heat pipe related patents.

Author

N73-33902*# New Mexico Univ., Albuquerque. Technology Application Center.

HEAT PIPE TECHNOLOGY: A BIBLIOGRAPHY WITH ABSTRACTS Quarterly Update, 1 Apr. - 30 Jun. 1972

30 Jun. 1972 35 p refs Sponsored by NASA
(NASA-CR-135955; TAC-BIBL-1(72/2)) Avail: NTIS HC
\$3.75 CSCL 20M

A bibliography of heat pipe research and development projects conducted during April through June 1972, is presented. The subjects discussed are: (1) general information, (2) heat pipe applications, (3) heat pipe theory, (4) design and fabrication, (5) test and operation, (6) subject and author index, and (7) heat pipe related patents.

Author

N73-33903*# New Mexico Univ., Albuquerque. Technology Application Center.

HEAT PIPE TECHNOLOGY: A BIBLIOGRAPHY WITH ABSTRACTS Quarterly Update, 1 Jul. - 30 Sep. 1972

30 Sep. 1972 42 p refs Sponsored by NASA
(NASA-CR-135952; TAC-BIBL-1(72/3)) Avail: NTIS CSCL
20M

A bibliography of heat pipe research and development projects conducted during July through September, 1972 is presented. The subjects discussed are: (1) general information, (2) heat pipe applications, (3) heat pipe theory, (4) design and fabrication, (5) testing and operation, (6) subject and author index, and (7) heat pipe related patents.

Author

N73-33904*# New Mexico Univ., Albuquerque. Heat Pipe Information Office.

HEAT PIPE TECHNOLOGY: A BIBLIOGRAPHY WITH ABSTRACTS Annual Supplement, 1971

1971 102 p refs
(NASA-CR-135951; TAC-Bibl-1(71/2)) Avail: NTIS HC \$7.25
CSCL 20M

The annual supplement on heat pipe technology for 1971 is presented. The document contains 101 references with abstracts and 47 patents. The subjects discussed are: (1) heat pipe applications, (2) heat pipe theory, (3) design, development, and fabrication of heat pipes, (4) testing and operation, (5) subject and author index, and (6) heat pipe related patents.

Author

07 ENERGY STORAGE

Includes flywheels, springs; heat stored in rocks, metals and other materials; nickel-cadmium batteries, lithium-sulfur batteries, solid electrolytes.

A68-12853

COMPOSITE FLYWHEEL STRESS ANALYSIS AND MATERIALS STUDY.

George F. Murgenthaler and Stanley P. Bonk (United Aircraft Corp., Pratt and Whitney Aircraft Div., East Hartford, Conn.).

IN: ADVANCES IN STRUCTURAL COMPOSITES; SOCIETY OF AEROSPACE MATERIAL AND PROCESS ENGINEERS, NATIONAL SYMPOSIUM AND EXHIBIT, 12TH, ANAHEIM, CALIF., OCTOBER 10-12, 1967, PAPERS.

North Hollywood, Calif., Western Periodicals Co. (SAMPE Science of Advanced Materials and Process Engineering, Volume 12), 1967, 14 p. 5 refs.

Lightweight, high-strength flywheels are of interest for short-term energy storage because of their potentially high energy-to-weight ratio. The feasibility of producing such a flywheel by using a composite Fiberglass-epoxy structure was investigated. A stress analysis was performed to study the orthotropic nature of composite materials and the effect of the choice of materials on the stress distribution. On the basis of the analysis, a flywheel was designed and tested. Although the wheel delaminated at a speed considerably below the predicted failure speed, the inner ring was analyzed, and it was found that the analytical technique correctly predicted the stress distribution in the wheel. Premature failure occurred because the radial properties of the composite material could not be determined sufficiently accurately prior to building the wheel, and the radial modulus of elasticity was significantly higher than predicted. As a result of the test, working values for the radial properties of the composite material were determined, the analytical techniques were verified, and the possibility of a delamination type of failure instead of a conventional burst-type failure was demonstrated.

(Author)

A68-22542 *

ELECTROCHEMICAL CATALYSIS.

J. O'M. Bockris and H. Wroblowa (Pennsylvania, University, Electrochemistry Laboratory, Philadelphia, Pa.).

IN: COMBUSTION AND PROPULSION; AGARD COLLOQUIUM ON ENERGY SOURCES AND ENERGY CONVERSION, 6TH, CANNES, FRANCE, MARCH 16-20, 1964, PAPERS.

Research sponsored by the Combustion and Propulsion Panel of NATO-AGARD.

Edited by H. M. McGroff, R. F. Hoglund, J. Fabri, T. F. Nagey, and R. E. Rumbaugh, Jr.

New York, Gordon and Breach, Science Publishers, Inc. (AGARDograph 81), 1967, p. 717-763; Discussion, M. Boudart (California, University, Berkeley, Calif.), J. M. Jenkins (Martech Consultants, Ltd.), and Norman Hackerman (Texas, University, Dept. of Chemistry, Austin, Tex.), p. 763-767. 102 refs.

Research supported by the United Aircraft Co., NASA, and USAF.

Discussion of the factors affecting the rates of chemical and electrochemical reactions. The differences between chemical and electrochemical catalysis arising from the existence of the applied field and from the presence of solvent are shown from the theoretical and experimental points of view. A review of the possible ways to enhance electrocatalysis is presented. The mechanisms of several electrode reactions (oxidation of hydrogen, hydrocarbons, oxalic acid, oxygen reduction) pertinent to fuel cell reactions are discussed in detail, as a prerequisite to all catalytic considerations. An attempt is made to formulate some theory of the mechanism of catalysis, on the basis of an experimental comparison of the reaction rates on various catalysts of hydrogen and oxygen evolution and of ethylene oxidation.

Needed trends in research are indicated.

(Author)

A68-23903

EXPERIMENTAL RESULTS OF A ONE MEGAJOULE INDUCTIVE ENERGY STORAGE SYSTEM.

E. Simon and G. Bronner (Princeton University, Plasma Physics Laboratory, Princeton, N.J.).

IN: SYMPOSIUM ON ENGINEERING ASPECTS OF MAGNETOHYDRODYNAMICS, 9TH, UNIVERSITY OF TENNESSEE, TULLAHOMA, TENN., APRIL 3-5, 1968, PAPERS.

Symposium sponsored by the Space Institute of the University of Tennessee, the American Institute of Aeronautics and Astronautics, the American Society of Mechanical Engineers, and the Institute of Electrical and Electronics Engineers.

Tullahoma, Tenn., University of Tennessee, Space Institute, 1968, p. 15, 16.

Results of tests of a newly conceived one-megajoule inductive energy storage system. The major components of this system are described. The energy storage inductor for this system is a water-cooled air-core coil with optimum shape. The tests demonstrate the feasibility of operating a system of this type.

P.v.T.

A68-25659

A RADIOISOTOPE HEATER FOR A SILVER-ZINC BATTERY.

I. Marshall Levy (Hittman Associates, Inc., Baltimore, Md.) and Thomas S. Bustard (Hittman Associates, Inc., Isotopic Power and Radiation Applications Dept., Baltimore, Md.).

IN: NUCLEONICS IN AEROSPACE; PROCEEDINGS OF THE SECOND INTERNATIONAL SYMPOSIUM, COLUMBUS, OHIO, JULY 12-14, 1967.

Symposium sponsored by the U.S. Air Force, the U.S. Atomic Energy Commission, and the Instrument Society of America.

Edited by Paul Polishuk.

New York, Plenum Press, Division of Plenum Publishing Corp., 1968, p. 200-207. 9 refs.

Army-sponsored research.

The use of a radioisotope heater is shown to be feasible as a heat source for maintaining silver-zinc battery temperatures in a low ambient environment. The advantage of this concept is a significant reduction in battery size and weight. The paper, after selection of an isotope and heat source (fuel capsule) design analysis, establishes a conceptual design of a compact silver-zinc battery heated by a radioisotope.

(Author)

A68-42313

SEPARATOR MATERIALS FOR LONG LIFE, HIGH RATE THERMAL CELLS.

F. C. Arrance and M. J. Plizga (McDonnell Douglas Corp., Douglas Aircraft Co., Missile and Space Systems Div., Astropower Laboratory, Newport Beach, Calif.).

IN: IECEC '68; INTERSOCIETY ENERGY CONVERSION ENGINEERING CONFERENCE, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 13-17, 1968, RECORD, VOLUME 1.

New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE Publication 68 C 21-Energy), 1968, p. 65-68.

The problems involved in the development of long-life, high energy density thermal cells are discussed with particular emphasis on lithium anode cells with a variety of cathodes in fused LiCl-KCl eutectic electrolyte. The compatibility of a variety of inorganic separators and their characteristics in thermal cell test fixtures are discussed. The test cell data reported indicate the feasibility of this approach for high-rate thermal cell development.

(Author)

A68-43812

OPTIMIZATION OF ENERGY STORAGE FOR SOLAR SPACE POWER.

G. C. Szego and B. Paiewonsky (Institute for Defense Analyses, Arlington, Va.).

Energy Conversion, vol. 8, Sept. 1968, p. 71-80.

Study of the conditions under which the solar energy may be stored for powering satellite and space-vehicle systems. The two principal means of such energy storage are: (1) the thermal energy collected from the sun is stored in a suitable heat sink, whence it can be drawn by the power converter during the dark period; and (2) the storage of electrical energy, after conversion during the illuminated period, in batteries for use as electrical energy without conversion during a later period. The optimum mode of energy storage to employ is analyzed for various power histogram profiles

07 ENERGY STORAGE

and for various periods of darkness in orbit. The parameters considered are: (1) efficiencies of the converter, of thermal storage, and of electrical storage; (2) orbital period; (3) fraction of orbital darkness; (4) specific masses of electrical storage, thermal storage, and converter; and (5) the power-time demand of the load. A broad spectral variation of numerical values is employed. The parametric relations are shown graphically and indicate the design conditions under which the optimal design (for minimum mass) requires thermal energy storage, electrical energy storage, or the combination of the two.

Z. W.

A69-15330

SECONDARY CELLS WITH LITHIUM ANODES AND IMMOBILIZED FUSED-SALT ELECTROLYTES.

Hiroshi Shimotake, George L. Rogers, and Elton J. Cairns (Argonne National Laboratory, Argonne, Ill.).

(American Chemical Society, Spring National Meeting, 155th, San Francisco, Calif., Mar. 31-Apr. 5, 1968.)

I & EC - Industrial and Engineering Chemistry, Process Design and Development, vol. 8, Jan. 1969, p. 51-56, 17 refs.

AEC-sponsored research.

Secondary cells with a liquid-lithium anode, a fused LiF-LiCl-LiI eutectic electrolyte immobilized as a rigid paste, and a liquid bismuth or tellurium cathode have been investigated in both the discharge and charge modes of operation. The lithium/bismuth cell operating from 380 to 485°C yielded current densities up to 2.2 A/cm², and a maximum power density of 0.57 W/cm² at 0.6 V. The cell contained an amount of lithium equivalent to 0.25 A-hr; the fully discharged cathode alloy composition was 41 at. % Li in Bi. The lithium/tellurium cell operating at 475°C yielded a short-circuit density of 2.2 A/cm², and a maximum power density of 1 W/cm² at 0.9 V. This cell contained an amount of lithium equivalent to 6.36 A-hr; the fully discharged cathode alloy composition was 71.6 at. % Li in Te. These performances suggest many applications, including special vehicle propulsion and energy storage. (Author)

A69-23990

U.S. ARMY ELECTRONICS COMMAND, ANNUAL POWER SOURCES CONFERENCE, 22ND, ATLANTIC CITY, N.J., MAY 14-16, 1968, PROCEEDINGS.

Red Bank, N.J., Power Sources Conference Publications Committee, 1968, 141 p. \$15.

CONTENTS:

NICKEL-CADMIUM CELLS FOR OPTIMUM OVERCHARGE CAPABILITY. R. L. Hadley (General Electric Co., Gainesville, Fla.) and A. J. Catotti (General Electric Co., New York, N.Y.), p. 42-46, 8 refs.

CELL DESIGN OPTIMIZATION. L. Belove and A. B. Mundel (Sonotone Corp., Elmsford, N.Y.), p. 46-50, 5 refs.

AUXILIARY ELECTRODE CHARGE CONTROL. F. E. Ford (NASA, Goddard Space Flight Center, Greenbelt, Md.), p. 53-57, 5 refs.

HIGH RATE BATTERY CHARGER SYSTEM. E. Kantner and H. J. Lennon (Culton Industries, Inc., Metuchen, N.J.), p. 61-65.

STABLE ZINC ELECTRODES. J. Goodkin (Yardney Electric Corp., New York, N.Y.), p. 79-82, 7 refs.

PERFORMANCE WITH STABLE SEPARATORS. A. Himy (McDonnell Douglas Corp., St. Louis, Mo.), p. 82-85.

METAL FLUORIDE COMPOUNDS AS CATHODES FOR THERMAL BATTERIES. C. B. Root and R. A. Sutula (U.S. Navy, Naval Ordnance Laboratory, Silver Spring, Md.), p. 100-102, 6 refs.

SOLID STATE BATTERIES. G. R. Argue, B. Owens, and I. J. Groce (North American Rockwell Corp., Canoga Park, Calif.), p. 103-105, 17 refs.

SOLID ELECTROLYTE BATTERIES. M. N. Hull, p. 106-109, 24 refs.

ATTENDANCE LISTS, p. 129-136.

A70-42454

Batteries and energy systems. C. L. Mantell. New York, McGraw-Hill Book Co., Inc., 1970, 231 p. 67 refs. \$14.

The construction, principles of operation, intended applications, and technical specifications are given for all currently used commercial types of batteries and energy systems. Preliminary sections detail the fundamental theoretical concepts of batteries as sources of electrical energy. The remainder of the text is divided into sections dealing with individual types of cells in terms of their manufacture, sizes, applications, charging and discharging characteristics, voltages, amperages, and power capabilities. Treated in turn are dry cells (zinc-ammonium chloride-manganese dioxide-carbon system), alkaline cells (zinc-alkali-manganese dioxide system), air depolarized cells, fuel cells, mercury cells, silver batteries, water activated systems, reversible systems, lead secondary cells, alkaline secondary cells, and the nickel-cadmium system. Regenerative electrochemical systems are described together with solar cells and related systems. A section dealing with research into new and special applications contains data for thermal cells and radioisotope power sources. T.M.

A70-46352

Gas-tight lead storage battery, requiring no attention (Wartungsfreie, gasdichte Bleibatterie). Harald Reber (Robert Bosch GmbH, Gerlingen, West Germany). *Bosch Technische Berichte*, vol. 3, Aug. 1970, p. 85-88. In German.

A series of experiments has led to the development of a gas-tight battery whose negative plates absorb oxygen. For this function, the important features are the use of pure lead in the plates and exact control of the content of sulphuric acid and paste in the plates. Control electrodes for rapid charging could be developed through the use of catalysts.

(Author)

A71-13041

Lithium-nickel sulfide batteries. Raymond Jasinski, Lewis Gaines, Gary Hansen, and Susan Carroll (Tyco Laboratories, Inc., Waltham, Mass.). In: Power Sources Symposium, 24th, Atlantic City, N.J., May 19-21, 1970, Proceedings. (A71-13026 03-03) Symposium sponsored by the U.S. Army. Red Bank, N.J., PSC Publications Committee, 1970, p. 98-100. Contract No. N 00019-68-60402.

Consideration of the lithium-nickel sulfide system as a high energy density, long shelf life battery. Prototype cells have yielded in excess of 100 watt-hr/lb when discharged at low rates, both at room and elevated temperatures. Laboratory cells using improved electrolyte solutions should give useful discharges down to -40 C. These results are directly applicable to the prototype cells described. A long shelf life system is implied by long-term tests on the compatibility of the battery components and from the low solubility of the Ni₃S₂ electrode in the cell electrolyte.

F.R.L.

A71-14767

American Society of Mechanical Engineers, Petroleum Mechanical Engineering and Pressure Vessels and Piping Conference, Denver, Colo., September 13-17, 1970, Proceedings. ASME, Transactions, Series B - Journal of Engineering for Industry, vol. 92, Nov. 1970, 131 p.

Contents:

The effect of biaxial stresses on fatigue and fracture. J. J. Kibler (GE Solid Mechanics Laboratory, Philadelphia, Pa.) and R. Roberts (Lehigh University, Bethlehem, Pa.), p. 727-734, 19 refs.

Analysis and design of ellipsoidal pressure vessels heads. E. P. Esztergar and H. Kraus (Rensselaer Polytechnic Institute, East Windsor Hill, Conn.), p. 805-817, 29 refs.

Analysis of shells of revolution formed of closed box section. Z. Zudans (Franklin Institute, Philadelphia, Pa.) and F. H. Gregory (U.S. Army, Ballistics Research Laboratories, Aberdeen Proving Ground, Md.), p. 818-826, 18 refs.

Analysis of stresses in shallow spherical shells with periodically spaced holes. L. E. Hulbert and F. A. Simonen (Battelle Columbus Laboratories, Columbus, Ohio), p. 834-840, 12 refs.

A72-33894 Problems of high temperature ZrO_2 - Solid electrolyte fuel cells. H. Tannenberger (Battelle, Geneva, Switzerland). In: From electrocatalysis to fuel cells; Proceedings of the Seminar, Seattle, Wash., December 9-11, 1970. Seattle, University of Washington Press, 1972, p. 235-246, 23 refs.

The use of cubic stabilized zirconia as a solid electrolyte in a fuel cell is discussed in relation to a high-temperature fuel cell system which would be an efficient and economical energy-conversion device. The optimization of the entire system makes it possible to specify the performance requirements for single elements and battery modules of the fuel cell itself. Some problems that are pertinent to the development of such a system are: finding the techniques to produce electrolyte layers between 10 and 50 microns thick in stable form and selecting proper materials for the electrodes. The choice of the anode metal is difficult, since those metals that are selected for their stability adhere to the electrolyte. The choice of cathode material is even more difficult because of the necessary chemical stability under oxidizing conditions. The noble metals are shown to be unsatisfactory for the purpose, and the stable oxides, which may also be considered, are generally unsuitable because of their low electronic conductivity and failure to meet other requirements. At present, only indium oxide is considered as a satisfactory cathode material. D.F.L.

A73-14744 Material requirements for the superflywheel. D. W. Rabenhorst (Johns Hopkins University, Silver Spring, Md.). In: Opportunities in materials; Proceedings of the Fourth Buhl International Conference, Pittsburgh, Pa., November 16-18, 1971. Pittsburgh, Carnegie Press, 1971, p. 195-205, 7 refs.

The superflywheel configurations utilize essentially straight filaments or thin rods. The new superflywheels have demonstrated a capability of storing about 30 watt-hours per pound. It appears certain that with growing operational experience the energy storage capacity will be significantly improved. Potential applications of the new device are related to vehicles, tools, power supplies, aircraft, spacecraft, and watercraft. A general description of the superflywheel system is given. Materials cost is discussed together with environmental aspects, materials stress and weight. G.R.

A73-25979 # New concepts in mechanical energy storage. D. W. Rabenhorst (Johns Hopkins University, Silver Spring, Md.). In: Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volume 1. Hinsdale, Ill., American Nuclear Society, 1972, p. 2-95 to 2-99, 12 refs.

A unique flywheel configuration is described which provides a new level of applicability for present and future anisotropic materials, including whisker materials. An energy storage capability of 30 watt-hours per pound of flywheel weight should be readily available, while performance in excess of this value is predicted for the future. Some additional improvements described include (1) a magnetic fluid hermetic seal that makes it possible to locate bearings and other equipment outside the vacuum can for lower drag and better lubrication, and (2) a new magnetic fluid bearing. T.M.

A73-38415 # Modern control techniques applied to energy conservation flight control systems. A. J. Verderese (Avco Everett Research Laboratory, Everett, Mass.). In: Intersociety Energy Conversion Engineering Conference, 8th, Philadelphia, Pa., August 13-16, 1973, Proceedings. New York, American Institute of Aeronautics and Astronautics, Inc., 1973, p. 609-613.

Analysis of an energy conservation flight control system consisting of a motor directly geared to a flywheel driving a power hinge through a mechanical servo. The primary goals of this investigation are to: (1) determine the 'appropriate' motor/flywheel

combination based on extreme synthesized duty cycles, while constraining the motor speed to never go below 3/4 rated speed; and (2) for the same duty cycles and motor constraint, optimize the motor/flywheel combination. The results indicate the pronounced advantage, in terms of reduced size and weight, when optimizing the above system as against just using a conservative design approach.

(Author)

N68-14818* National Aeronautics and Space Administration. Washington, D. C.

ELECTROCHEMICAL SPACE POWER SOURCES

Ernst M. Cohn 1967 122 p refs Presented at the AGARD/NATO Lecture Series, Brussels, Belgium, 2-5 October 1967 (NASA-TM-X-60795) CFSTI: \$3.00 CSCL 10B

After a general discussion of electrochemical energy storage and electricity generation in aerospace, the thermodynamic and kinetic electrochemical basis for these devices, as well as criteria for selecting electrochemically active materials and estimating energy densities are presented. The following three sections cover primary and secondary equipment, either now being used or of potential usefulness in space. The last two sections relate some design criteria for space power systems and consider possible earth-bound applications of space-oriented electrochemical research and development. Author

N68-15938 Communariat à l'Énergie Atomique, Saclay (France). Centre d'Études Nucleaire.

ENERGY STORAGE POSSIBILITIES OF SUPERCONDUCTORS WITH A VIEW TO LARGE POWER DISCHARGES [STOCKAGE D'ENERGIE POSSIBILITES DES SUPRA-CONDUCTEURS EN VUE DES DECHARGES DE GRANDES PUISSANCES]

Jean Sole Jun. 1967 14 p refs In FRENCH (CEA-R-3243)

Condensers, turning machines, combustible piles, accumulators, and explosives are considered in relation to energy storage possibilities of superconductors. Energy supply, role of dielectrics, and energy density in dielectric materials are discussed for the semiconductors; and attention is given to the optimization of energy storage and release of energy. Transl. by M.W.R.

N68-17798 Pennsylvania Univ., Philadelphia.

PROSPECTS FOR THERMAL ENERGY STORAGE

Manfred Altman In AGARD Combust. and Propulsion 1967 p 135-149 refs (Grant NSG-316)

This paper is concerned with the problem of developing a method of storing thermal energy by the utilization of the heat of fusion of suitable compounds. The first part of the paper discusses the incentives for the development of this type of energy storage. The second part deals with the problem of synthesizing suitable materials. The third part discusses the problem of obtaining the needed heat transfer properties. The main conclusions of this work are as follows: (1) A good case can be made for space power systems utilizing thermal energy storage. (2) This is predicated on technical developments which appear probable, but which have not yet been accomplished. (3) A great deal of work remains to be done in two major research areas. One, the determination of phase diagrams of promising eutectic mixtures, and two, the experimental and theoretical determination of heat transfer properties. (4) A carefully planned systematic approach is needed to obtain the information necessary for systems comparisons. Author

N68-23614# Defense Dept., Washington, D. C. INTERIOR COATING SYSTEMS FOR SURFACES IN CONTACT WITH PETROLEUM FUELS Technical Manual

07 ENERGY STORAGE

Mar. 1968 57 p refs
(AD-666969)

This manual is intended to be a technical reference and guide to the materials, application methods, inspection techniques and specifications that will yield the best internal coatings for surfaces of containers in contact with petroleum fuels. Its purpose is to serve as a tool that will help toward improved and uniform practices in the selection and application of the most appropriate coatings. Comments are included on coating surfaces of containers--from the 5-gallon can to the largest storage tank or tank vessel, both metal and nonmetal, whether used for storage or for handling military fuels.

TAB

N68-33238* National Aeronautics and Space Administration. Lewis Research Center. Cleveland, Ohio.

A SNAP-8 BREADBOARD SYSTEM. OPERATING EXPERIENCE.

J. N. Hodgson (Aerofjet-General Corp., Azusa, Calif.) and R. P. Macosko Aug. 1968 35 p refs Presented at the IEEE Intersoc. Energy Conversion Eng. Conf., Boulder, Colo., 13-16 Aug. 1968 (NASA-TM-X-61161; Rept.-3511) CFSTI: HC \$3.00/MF \$0.65 CSCL 18N

SNAP-8 is a 35 kw nuclear-electric space power system. The system operates on a mercury Rankine cycle using NaK (eutectic sodium-potassium mixture) as the heat-input and heat-rejection working fluids. The test program has evolved from an initial component test phase to testing of complete breadboard systems. Extensive testing has provided information on the relationships between components and the system. Data are presented showing the perturbations, and their consequences, inherent in a dynamic system. Cause and effect relative to boiling instability, system contamination, inventory control, testing mishaps, and transient operation are presented as observed during the test program. The breadboard approach to system testing and design has proven appropriate. A close simulation to flight-configuration testing has been accomplished while maintaining the design flexibility of a breadboard system.

Author

N69-11907* Institute for Defense Analyses, Arlington, Va. Science and Technology Div.

ONE WATT 30-DAY PLUS POWER SOURCES

Robert C. Hamilton Aug. 1968 50 p refs
(Contract DAH15-67-C-0011)
(AD-675936; IDA/HQ-68-8703; RP-P-412) Avail: CFSTI CSCL 10/3

Four alternative power sources are considered as replacements for the mercury cells which are currently used. Of these, silver-zinc batteries can double the watt-hour per pound performance and have twice the life of mercury cells; zinc-air batteries could improve the w-hr/lb performance another 50 percent. Hydrogen-air and hydrogen-oxygen fuel cells offer no advantage over present power sources. Solar cell-battery power systems are advisable for some applications.

Author (TAB)

N69-12431* TRW Systems Group, Redondo Beach, Calif.
MODULAR ENERGY STORAGE AND CONDITIONING (MESAC) STUDY Interim Report
10 Dec. 1968 75 p
Avail: CFSTI

As a means of overcoming the relative unpredictability of battery power systems reliability, an assessment is made of the modular energy storage and conditioning (MESAC) concept which combines electronics with batteries in a centrally controlled modular system. Basically, the system consists of an internally redundant single central control unit for sensing the system bus voltage and

controlling the operation of the electronics in each of several energy storage units (ESU). For the analysis, the ESU was divided into two power handling sections: the uplink (discharge) converter; and the downlink (charge) converter. Circuit implementation tradeoff studies were conducted, and equations are included to describe the performance, efficiency, and weight of the uplink converter. Equations developed to describe the downlink converter performance contain compensation for the less-than-unity ampere-hour efficiency of battery cells on charge. Battery failure rates are defined, and a battery reliability model is developed. The computer source program is included.

M.G.J.

N69-13298* Kernforschungsanlage, Juelich (West Germany).
SOME PROBLEMS OF LIGNITE GASIFICATION BY MEANS OF HIGH-TEMPERATURE NUCLEAR REACTOR HEAT [UEBER EINIGE PROBLEME BEI DER VERGASUNG VON BRAUNKOHLN MIT HOCHTEMPERATUR-KERNREAKTOR WAERME]

K. Kugeler und A. T. Bhattacharyya Aug. 1968 37 p refs In GERMAN
(JUL-554-RG) Avail: CFSTI

A system and a facility for the generation of electric current and gas are described. Data of the speed of gasification of lignite with steam are given in addition to a description of the basic gasification reactions and their dependence on temperature and pressure. The gas composition that can be expected is calculated as a function of the variables. Several possible arrangements of the system are shown. The balances of quantity and energy for the gasification space give a first indication of the amounts of synthesis gas that can be expected and the requirements for heat from the nuclear reactor. A methanol bath for the removal of CO₂ and H₂S from the synthesis gas is briefly described. The efficiency of the entire plant is discussed, and prices for the synthesis gas are estimated.

Transl. by K.W.

N69-14302* Los Alamos Scientific Lab., N. Mex.
SOLID SOLUTION OXIDE FUELS FOR SPACE ELECTRIC POWER HEAT SYSTEM

J. A. Leary [1968] 8 p Presented at Potential Contractors Conf on NAVSAT, Albuquerque, N. Mex., 4 Jun. 1968
(Contract W-7405-ENG-36)
(LA-DC-9686; CONF-680626-1) Avail: CFSTI

A brief review of progress in the development of solid solution oxide fuel disks for power systems in space vehicles is presented. Phases discussed include crystallographic structure, preparation from powders, chemical composition, compatibility, power densities, and physical properties.

NSA

N69-15054 Oklahoma State Univ., Stillwater.
A SYSTEM FOR THE ECONOMIC ANALYSIS OF BALANCED ENERGY CONVERSION AND STORAGE SYSTEMS

Arthur Bruckner, II (Ph.D. Thesis) 1967 231 p
Avail: Univ. Microfilms: HC \$10.60/Microfilm \$3.00 Order No. 68-8369

A simulation system is developed to examine the economic feasibility of combined energy conversion and storage systems on the basis of annual energy demand. Annual demand is the basis for the optimization trade-off function in order to realize the full savings potential from generation plant investment as well as short term advantages in fuel economies. The objectives are the determination of storage equipment requirements so that the necessary or high potential research directions are identified in the early stages of a research and development project. Some case study indications are: no major annual effects on fuel costs; equipment cost advantages between storage procedures; probable cost advantages from over-capacity generation facilities in uncon-

ventional energy source systems. Extended storage technology research in balanced nuclear plant generation and storage systems is a recommendation. Dissert. Abstr.

N69-18042*# TRW Systems, Redondo Beach, Calif.
BATTERIES FOR SPACE POWER SYSTEMS
 Paul Bauer Washington NASA 1968 314 p refs
 (NASA-SP-172) Avail: CFSTI CSCL 10C

A summary of all NASA sponsored work on batteries and related electrochemistry is given. Basic processes in a galvanic cell and operational and test problems of all types of batteries are outlined and data requirements for the design of sophisticated, high-efficiency space electric-power systems are analyzed. The validity and usefulness of individual battery systems for spacecraft applications are evaluated with emphasis on battery selection and integration into high efficiency electric-power systems. G.G.

N69-24894*# General Electric Co., Gainesville, Fla. Battery Business Section.

OPTIMIZATION OF DESIGN PARAMETERS FOR SPACECRAFT NICKEL-CADMIUM CELLS CONTAINING RECOMBINATION AND CONTROL ELECTRODES Quarterly Report, Aug. - Oct. 1968

P. R. Voyentzie and G. Rampel Mar. 1969 45 p ref
 (Contract NAS5-11547)
 (NASA-CR-100813; QR-2) Avail: CFSTI CSCL 10B

The cycle capability of cells constructed with oxygen-sensing (signal) and oxygen recombination electrodes was investigated. The cycle regimes in the tests were more rigorous than normally used aboard spacecraft, and ambient temperatures and depths-of-discharge were greater than those normally used, thereby permitting faster evaluation of the effect of differences in the subgroup experiments. The work aims to extend the operational capability of the nickel-cadmium space battery. Cycle data indicate a requirement for negative precharge levels greater than 75% of the excess negative capacity for cells (equivalent to a negative-positive ratio of 1.40 negative precharge) which are to be cycled to depths-of-discharge approaching 75% and/or at ambient temperatures approaching 40°C. The recombination-to-negative load resistance value proved to be critical for optimum cycle life. A 2.0 ohm value for this resistor yields significantly greater cycle life at 40°C than does a value of 0.1 ohm. A decrease in signal electrode sensitivity was noted after 40°C exposure. Author

N69-34688# Bosch (Robert) G.m.b.H., Stuttgart (West Germany).
TECHNICAL REPORTS, VOLUME 2, NUMBER 5
[TECHNISCHE BERICHTE, BAND 2, HEFT 5]
 Nov. 1968 57 p refs In GERMAN; ENGLISH summaries
 Avail: CFSTI

CONTENTS:

1. DEVELOPMENT OF BATTERIES FOR AUTOMOBILES WITH ELECTRIC PROPULSION Hermann Dietz p 211-219 refs
2. PLASMA-SPRAYED ELECTRICALLY INSULATING CERAMIC COATINGS Kuno Kirner p 220-226 refs
3. SINTERING PROCESS AND RADIAL RUPTURE STRENGTH OF Fe/Sn AND Fe/Cu/Sn SINTERED SPECIMENS F. Esper, K.-H. Friesse, and R. Zeller p 227-244 refs
4. MONITORING AND CONTROL OF VAPOR DEPOSITION PROCESSES BY MEANS OF QUARTZ CRYSTAL VIBRATORS Klaus Berger and Arno Illenberger p 245-252 refs (See

N69-34692 20-14)

5. TEMPERATURE EFFECTS IN THICKNESS MEASUREMENTS OF EVAPORATED FILMS BY MEANS OF QUARTZ VIBRATORS Karl Kerner p 253-256 refs

6. CAPACITIVE MEASUREMENT OF THIN QUARTZ PROTECTIVE COATINGS ON ALUMINUM REFLECTORS Heinrich Knapp p 257-260 refs

N69-34689# Bosch (Robert) G.m.b.H., Stuttgart (West Germany).
 Laboratorium für Elektrochemie.

DEVELOPMENT OF BATTERIES FOR AUTOMOBILES WITH ELECTRIC PROPULSION [ENTWICKLUNG VON BATTERIEN FÜR ELEKTRISCH ANGETRIEBENE KRAFTFAHRZEUGE]

Hermann Dietz In its Tech. Rept., Vol. 2, No. 5 Nov. 1968 p 211-219 refs In GERMAN; ENGLISH summary

Avail: CFSTI

Power sources for electric automobiles require a high energy/weight ratio and favorable service and maintenance at low initial and operating costs. This is a survey on existing batteries and systems under development. Fuel cells, metal-air, non-aqueous, high temperature, and organic electrolyte batteries are discussed. ESRO

N70-22537# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

PRIMARY ENERGY STORAGE AND THE SUPER FLYWHEEL

D. W. Rabenhorst Sep. 1969 65 p refs
 (Contract N0W-62-0804-C)

(AD-697906; APL-TG-1081) Avail: CFSTI CSCL 10/3

This report describes new flywheel configurations that promise an order of magnitude improvement as energy storage devices. As presently conceived, the energy density has been improved over ten times, with the prospect for additional improvement in performance as the next generation of high strength uniaxial filamentary materials becomes available. This super flywheel is significant in its application to the urban electric vehicle. Instead of only being used to reduce the acceleration power requirements, as has been proposed in many studies, the new flywheel can actually be used as the primary energy source, and batteries can be eliminated altogether. Many other applications are also discussed.

Author (TAB)

N70-38713* National Aeronautics and Space Administration.
 Goddard Space Flight Center, Greenbelt, Md.

SWITCHING MECHANISM WITH ENERGY STORAGE MEANS Patent

William A. Leavy, inventor (to NASA) Issued 21 Jul. 1964 (Filed 18 Sep. 1961) 5 p Cl. 200-39

(NASA-Case-XGS-00473; US-Patent-3,141,932;

US-Patent-Appl-SN-139012) Avail: US Patent Office CSCL 13I

A driven switch actuation mechanism, with a mechanical reset feature capable of completing its operation cycle after the input drive is deactivated, is described. A rotatable coil spring stores energy as a result of the rotation of the driven device, such as a tape recorder, and is triggered by the device when it reaches a desired position. The stored energy is sufficient to allow the cutoff switch to be actuated and to return the switch to its normal operating position. N.E.N.

N71-11913# McElroy (Ralph) Co., Austin, Tex. Custom Div.
ENERGY STORAGE IN A SUPERCONDUCTING WINDING
[STOCKAGE D'ENERGIE DANS UN ENROULEMENT SUPRACONDUCTEUR]

M. Ferrier [1969] 11 p refs Transl. into ENGLISH from Bull. Inst. Int. Froid, Annexe (France), no. 1, 1969 p 425-432

07 ENERGY STORAGE

Sponsored in part by AEC Prepared for Los Alamos Scientific Lab.
(LA-tr-70-9) Avail: NTIS

The problems of energy storage on the scale of the fluctuations of the national or regional load, i.e., of the order of 1,000 MWh are examined. Various configurations are reviewed, and the short solenoid of circular cross section is selected as being economically the most favorable. The field produced and the distribution of the mechanical constraints are discussed for this configuration. An examination of the various losses (at the surface of the cryostat, by mechanical or magnetic hysteresis) shows that they are acceptable. The circulation of the cryogenic fluid is discussed in detail, and it is shown that the ratio of stabilizing material to superconducting material can be reduced to 10:1. Finally, the modes of connecting the storage device to the grid are examined and there is a discussion of the optimum size of the installation as a function of the financial benefits that can be attributed to the different services provided by the device.

Author (NSA)

N71-13514*# Cambridge Thermionic Corp., Mass.

MODIFICATION OF DC MOTOR WITH MAGNETICALLY SUSPENDED ROTOR TO GIVE HIGHER MOMENTUM STORAGE CAPACITY, SUPPLEMENT Technical Report, 1

Apr. -31 Jul. 1970

31 Jul. 1970 21 p

(Contract NAS5-11585)

(NASA-CR-115792) Avail: NTIS CSCL 09E

A 2.1 lb. flywheel was added to the existing rotor which necessitated improving the total magnetic support capability of the bearing by adding two more ridges to each rotor and stator pole face. The ridges increased the support capability of the bearing without increasing the power requirement. A stronger permanent magnet was installed in the rate generator circuit so that a sufficient rate signal could be generated with the increased rotor weight. The existing motor and bearing housing was discarded in favor of a rigid clamping frame to accommodate the six inch diameter flywheel. A portion of the old housing was used to support the motor armature and commutator. These modifications improved the support capability, stiffness, and efficiency with no increase in power consumption.

Author

N71-17471*# TRW Systems Group, Redondo Beach, Calif.

MODULAR ENERGY STORAGE AND CONDITIONING (MESAC) STUDY Final Report

Jul. 1970 130 p

(Contract NAS5-9178)

(NASA-CR-116510) Avail: NTIS CSCL 10A

The concept of a centrally controlled modular energy storage and conditioning system for improved reliability of power systems containing batteries was studied. Estimated weight, efficiency, and reliability were analyzed and compared with conventional systems and a breadboard phase containing typical parallel energy storage units. Results established that high efficiency direct energy transfer from source to load without loss elements and at regulated voltages is feasible. A modification of the drive circuitry is necessary to increase boost ratios. The breadboard performed all required functions and continued to operate at rated power levels after simulated failure of one of the energy storage units.

G.G.

N71-22199# National Research Council of Canada, Ottawa (Ontario). Low Temperature Lab.

PRESENT STATUS OF ELECTRIC AUTOMOBILES

J. J. Gottlieb *In its Quart. Bull. of the Div. of Mech. Eng. and the Natl. Aeron. Estab.*, Oct.-Dec. 1970 31 Dec. 1970 p 1-38 refs (See N71-22198 11-15)

Avail: NTIS

The scope of the study includes developments in batteries, fuel cells and hybrid systems, controllers, chargers, electric motors,

and body design features. Problems due to thermal conditioning and corrosion are also discussed.

Author

N71-23515*# Translation Consultants, Ltd., Arlington, Va.

ENERGY STORAGE CAPABILITIES OF SUPERCONDUCTORS IN VIEW OF HIGH POWER DISCHARGE [STOCKAGE D'ENERGIE POSSIBILITES DES SUPRACONDUCTEURS EN VUE DES DECHARGES DE GRAND PUISSANCES]

J. Sole Washington NASA Apr. 1971 25 p refs Transl. into ENGLISH of CEA, Saclay, France report CEA-R-3243

(Contract NASw-2038)

(NASA-TT-F-13585; CEA-R-3243) Avail: NTIS CSCL 10C

The energy storage capabilities of superconductors and the associated energy release at high power is discussed. A parallel and comparison is drawn between existing energy storage mechanisms (condensers, rotating machines, reactors, batteries, explosives) and the so called superconductors as seen from French experimental results. Direct comparisons are drawn by using material evaluations, performance equations and cost price ratios.

Author

N72-11410# Lockheed Missiles and Space Co., Sunnyvale, Calif. Ground Vehicle Systems.

FLYWHEEL FEASIBILITY STUDY AND DEMONSTRATION Final Report

R. R. Gilbert, J. R. Harvey, G. E. Hever, and L. J. Lawson 30 Apr. 1971 185 p refs

(Contract EHS-70-104)

(PB-200143; LMSC-D0079115) Avail: NTIS CSCL 13I

The feasibility of application of flywheel only and flywheel hybrid propulsion systems to four classes of vehicles is studied.

Author (GRA)

N72-11982*# TRW Systems Group, Redondo Beach, Calif.

THE 20 kW BATTERY STUDY PROGRAM Final Report

30 Jul. 1971 421 p refs

(Contract NAS5-21066)

(NASA-CR-122296; TRW-13837-6001-RO-00) Avail: NTIS HC \$6.00/MF \$0.95 CSCL 10C

Six battery configurations were selected for detailed study and these are described. A computer program was modified for use in estimation of the weights, costs, and reliabilities of each of the configurations, as a function of several important independent variables, such as system voltage, battery voltage ratio (battery voltage/bus voltage), and the number of parallel units into which each of the components of the power subsystem was divided. The computer program was used to develop the relationship between the independent variables alone and in combination, and the dependent variables: weight, cost, and availability. Parametric data, including power loss curves, are given.

Author

N72-17020*# Astro Research Corp., Santa Barbara, Calif.

APPLICATION OF ISOTENSOID FLYWHEELS TO SPACE-CRAFT ENERGY AND ANGULAR MOMENTUM STORAGE Final Report

L. R. Adams Washington NASA Feb. 1972 66 p refs

(Contract NAS7-728)

(NASA-CR-1971; ARC-R-423) Avail: NTIS CSCL 09E

Studies and experiments with the concept for expandable flywheel structures, using isotensoid filament geometry and centrifugal force, are reported. Systems employing the isotensoid flywheel are evaluated in terms of energy density (watt-hr/lb) and angular momentum density (ft-lb-sec/lb) and compared with standard electrochemical storage devices and rigid control-moment gyro wheels.

Author

N72-17829# Los Alamos Scientific Lab., N.Mex.
ENERGY STORAGE AND SWITCHING WITH SUPERCONDUCTORS

H. L. Laquer and F. L. Ribe 1971 3 p Presented at the Intern. Working Session on Fusion Reactor Technol. Conf., Oak Ridge, Tenn., 1 Jul. 1971

(LA-DC-12990) Avail: NTIS

Inductive magnetic energy storage with superconductors or cryogenic aluminum conductors is discussed in regard to its use in providing the magnetic fields needed in pulsed thermonuclear reactors and in some large-scale pulsed plasma physics experiments designed to demonstrate the scientific feasibility of controlled fusion. NSA

N72-26856# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany). Inst. fuer Energiewandlung und Elektrische Antriebe.

ENERGY STORAGE IN SUPERCONDUCTING COILS
 C. Carpentis 6 Mar. 1972 59 p refs In GERMAN; ENGLISH summary (DLR-FB-72-10) Avail: NTIS HC \$5.00; DFVLR Porz-Wahn; 20, DM

The storage of energy in superconducting coils and the capital costs of such a practice are discussed. The field intensity in the coil, the current density of the superconductor, and a characteristic dimension of the coil are related to the geometry of coil and the energy stored in it. Such data allows optimization of the coil with respect to its specific mass. A comparison of the superconducting coil with other energy storage systems revealed that the superconducting systems are characterized by relatively low specific mass and low capital costs, especially where high discharge power is required. Author

N73-13997# Phillips Scientific Corp., Bartlesville, Okla.
INVESTIGATION OF NAVY AIRCRAFT FUEL DISPENSING METHODS

D. P. Keeler and E. E. Kleinmann Apr. 1972 212 p (Contract N00025-71-C-0026) (AD-748211) Avail: NTIS CSCL 15/5

The report is the result of study to determine the most effective, practical, and economical system for onshore fueling of Navy aircraft, including fighters, patrol, helicopters, and transport aircraft. The Recommended Service Station Fueling System is a pressure system automatically controlled by fuel demand, utilizing groups of pumps, filter-separators, and a pipeline distribution system arranged for extreme flexibility and simplicity in operation. A minimum of hydraulic and electric controls are used, and no radio or telephone is required for coordination of fueling. The Recommended Service Station Fueling System consists of fueling spots to which aircraft come for fueling. Each fueling spot consists of a meter, a primary and secondary pressure control valve, a filter-separator, and a loading hose or arm to transfer fuel from a pipeline to the aircraft. Author (GRA)

N73-19061# Argonne National Lab., Ill.
DEVELOPMENT OF HIGH-SPECIFIC-ENERGY BATTERIES FOR ELECTRIC VEHICLES Progress Report, Feb. - Jul. 1972
 E. J. Cairns, E. C. Gay, R. K. Steunenberg, H. Shimotake, J. R. Selman, T. L. Wilson, and D. S. Webster Sep. 1972 114 p refs

(Contract W-31-109-eng-38) (ANL-7953) Avail: NTIS

The technology required to construct secondary batteries having the performance capabilities required for pollution free electric automobiles is discussed. Batteries for this application should have an energy storage capability of 220 W/kg. Their cost should not exceed about \$10/KW-hr of energy storage capability. Lithium/sulfur cells using a molten lithium halide-containing electrolyte and operating at 360 to 390 C have achieved capacity densities of up to 0.9 A-hr/sq cm (above 1 V) at a current density of 0.9 A/sq cm with a cycle life of more than 2000 cycles during 7000 hr of operation. The enclosed mixed-

cathode Cell L-9 had a cycle life and lifetime of 150 cycles and 1000 hr, respectively, with a capacity density up to 0.4 A-hr/sq cm at a current density of 0.24 A/sq cm to a 1.0-V cutoff. These results are consistent with the specific energy and specific power goals, but the cycle life and the sulfur electrode performance require further improvement. Author

N73-21084# Sandia Labs., Albuquerque, N.Mex.
ADVANCEMENTS IN PELLET-TYPE THERMAL BATTERY TECHNOLOGY

D. M. Bush Oct. 1972 86 p refs Sponsored by AEC (SC-RR-69-497-A) Avail: NTIS

The development of a prototype thermal battery incorporating a pelletized heat source is reported. Recent batteries, operating at a 61 percent higher current density, gave an average life of 13.8 minutes. The Ca/LiClKCl, CaCrO₄/Fe system has been used throughout. Changes made to the battery design that have resulted in improved performance included a modified heat source, the use of bimetal anodes, a more efficient electrolyte immobilizer, special heat buffer pellets, new powder processing techniques, a light-weight container, and a new insulating material. Techniques have been devised to record cell stack temperatures during battery discharge. The investigations leading to these design changes are discussed and test results that have been obtained with recent control batteries are presented. Author

N73-23014# Magnetic Corp. of America, Waltham, Mass.
DEVELOPMENT OF PULSED HIGH ENERGY INDUCTIVE ENERGY STORAGE SYSTEMS, VOLUME 1 Technical Report, Apr. 1971 - Apr. 1972

Edward J. Lucas, William F. B. Punchard, and Richard J. Thome Dec. 1972 231 p (Contract F33615-71-C-1454; AF Proj. 3145) (AD-755359; AFAPL-TR-72-38-Vol-1) Avail: NTIS CSCL 10/2

Major problems associated with the design of a repetitively pulsed 100 kJ energy storage system are explored and solutions presented. Recommendations as to the design of future systems are made. Based on the results of a theoretical analysis into loss mechanisms in copper/superconductor composites, a braid composed of 4.5 x 10 to minus 3rd power inch diameter strands was selected for further investigation. Coils having stored energies of about 1 and 10 kJ were constructed from this braid and loss measurements made while the coils were being repetitively pulsed at rates of 1 and 5 pulses per second. Author (GRA)

N73-26054# Magnetic Corp. of America, Waltham, Mass.
DEVELOPMENT OF PULSED HIGH ENERGY INDUCTIVE ENERGY STORAGE SYSTEMS, VOLUME 3: WEIGHT OPTIMIZATION FOR ENERGY STORAGE, COIL, CRYOGEN AND DEWAR Technical Report, Apr. 1971 - Apr. 1972

Edward J. Lucas, William F. B. Punchard, and Richard J. Thome Wright-Patterson AFB, Ohio AFAPL Dec. 1972 109 p (Contract F33615-71-C-1454; AF Proj. 3145) (AD-755360; AFAPL-TR-72-38-Vol-3) Avail: NTIS CSCL 10/2

The report provides weight estimates for possible configurations which may be used in one of these subsystems, that which is devoted to energy storage. For the purposes of this study, it will be assumed that the energy storage subsystem consists of three components: (1) the cryogenic coils, (2) the cryogen and (3) the dewar. The limits of the subsystem are the electrical terminals entering and leaving the dewar. All other components are assumed to be located in other subsystems. The method of determining the weights of the components of the subsystem will be discussed, followed by a discussion of the manner in which subsystems were optimized. The section closes with tables giving characteristics of weight optimized systems for a range of energy, pulse length, total pulses, wire diameter, and copper to superconductor ratio. GRA

07 ENERGY STORAGE

N73-30058# Argonne National Lab., Ill.

LITHIUM/SULFUR BATTERIES FOR OFF-PEAK ENERGY STORAGE: A PRELIMINARY COMPARISON OF ENERGY STORAGE AND PEAK POWER GENERATION SYSTEMS

M. L. Kyle, E. J. Cairns, and D. S. Webster Mar. 1973 116 p
refs

(Contract W-31-109-eng-38)

(ANL-7958) Avail: NTIS HC \$5.45

The use of lithium/sulfur batteries as load-leveling devices in electrical utility networks could provide both economic and ecological benefits in meeting the growing demand for energy. A battery designed for this application should have an initial capital cost of \$12 to \$15/kW-hr of energy storage capacity and a lifetime of at least five years. A typical duty cycle is expected to be a 10 to 14 hr discharge followed by a 4 to 8 hr charge with the battery operating about 5 days per week. Economic and cell performance goals for the development of a battery system are presented. A preliminary comparison of the costs of batteries, pumped hydroelectric storage and gas turbines indicates that, under some conditions, batteries should be considered as load-leveling devices. The lithium/sulfur battery system is in too early a state of development to accurately predict its place in the utility system. Author (NSA)

N73-31676*# Kanner (Leo) Associates, Redwood City, Calif.

SUPERCONDUCTIVE ENERGY STORAGE

S. L. Wipf Washington NASA Sep. 1973 43 p refs Transl. into ENGLISH of "Supraleitende Energiespeicher", Max-Planck-Inst. fuer Plasmaphys., Garching, West Germany, report IPP-2/211, Feb. 1973 39 p

(Contract NASw-2481)

(NASA-TT-F-15109; IPP-2/211) Avail: NTIS HC \$4.25 CSCL 20L

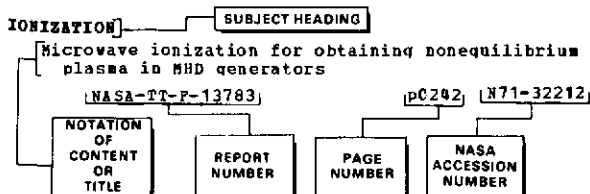
Superconductive energy storage is surveyed with regard to advantages, problems and applications. Advantages are large capacity and discharge rate, and relatively high energy density. Problems are optimization of coil form, discharge, development of a suitable superconducting switch, and minimization of alternating-current losses in order to maintain superconduction during discharge. Some proposed solutions are outlined. Envisioned applications include pinch experiments in plasma physics directed toward a pulsed fusion reactor, and power supply for lasers. Author

SUBJECT INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Subject Index Listing



The subject heading is a key to the subject content of the document. The Notation of Content (NOC), rather than the title of the document, is usually used to provide a more exact description of the subject matter. (AIAA occasionally uses the title in lieu of the NOC.) The report number helps to indicate the type of document cited (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the Notation of Content, e.g., p0242 N71-32212. Under any one subject heading, the accession numbers are arranged in sequence with the /AA accession numbers appearing first.

A

ABLATIVE MATERIALS

Improved technology for multiwatt radioisotope heater units. p0188 A73-36681

ABSORPTANCE

Cylindrical solar array absorptance as function of solar flux vector inclination, using Gier-Dunkle integrating sphere [AIAA PAPER 72-57] p0037 A72-16909

ABSTRACTS

Abstracts for symposium on uranium plasma research [NASA-CR-107857] p0229 N70-17651

AC GENERATORS

Liquid metal MHD power generation, discussing high magnetic Reynolds number direct AC induction generator, power cycles and operations p0138 A68-42582

Liquid flow MHD alternating current generator design, considering induced current in rotor and resulting magnetic field in pole gap p0149 A69-27495

Superconducting magnet ac generators development, emphasizing conversion efficiency, manufacturing, relative costs, machine geometry and interwinding coupling factor effects p0182 A73-11833

Brayton cycle solar dynamic turboalternator space electric power system technology developments during 1962-1972, considering power efficiency, components reliability and future missions p0185 A73-25982

Breadboard model of Brayton cycle alternator and voltage regulator-exciter [NASA-TN-D-4697] p0204 A68-29960

Design and testing of 1200-Hz alternator and voltage and frequency controls for Brayton space power systems [NASA-TN-X-52453] p0205 A68-31042

Electrical parameters of synchronous MHD generator with pulsating electrical conductivity of incompressible fluid [SM-74/210] p0211 A69-13333

Turbine performance in gas-bearing Brayton cycle turboalternator [NASA-TN-D-5604] p0227 N70-14220

AC generators for converting mechanical to electrical energy for space power systems p0228 N70-16224

Description and evaluation of digital computer program for analysis of Lundell alternators [NASA-TN-D-5814] p0233 N70-28433

Series of no-contact synchronous generators with outputs up to 100 kV for wind-driven electric units [AD-742641] p0101 N72-31082

ACCELERATED LIFE TESTS

Thermionic converters performance and life tests, discussing test equipment and diffusion effect on emitter stability p0180 A72-36139

ACCELERATION (PHYSICS)

Liquid metal stream acceleration by same metal vapor for application in magnetohydrodynamic generator [ANL-TRANS-508] p0192 A68-12691

ACCELERATORS

Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities [JPRS-46752] p0208 A69-11943

ACCUMULATORS

Collector temperature influence on maximum efficiency of thermionic converter in series battery p0025 A68-43817

ACETATES

The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol. p0076 A73-25465

ACETYLENE

Minimum required energies for direct initiation of gaseous detonation waves in acetylene-oxygen mixtures [BM-RI-7061] p0116 A68-12434

ACIDS

Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania [E73-11112] p0112 N73-33269

ACOUSTIC PROPAGATION

The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel p0075 A73-12955

ACTINIUM

State of development of an actinium fueled thermionic generator. p0075 A72-36169

Production, purification, and conditioning of Ac-227 and development of isotopic heat source fueled with Ac-203 [A/CONF-49/P/287] p0098 N72-16196

ADDITIVES

Temperature drop in combustion chamber of open cycle MHD power plant due to added potassium carbonate as function of various parameters p0140 A69-14162

GaAs solar cells performance as function of doping levels, ascribing poor efficiencies to surface recombinations p0032 A70-21721

Lithium-diffused p-n silicon solar cells of high conversion efficiency and improve resistance to space radiation effects [NASA-CR-97077] p0051 A68-35814

ADIABATIC CONDITIONS

Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air p0080 A68-19175

AERIAL PHOTOGRAPHY

SUBJECT INDEX

AERIAL PHOTOGRAPHY

- Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner p0074 A72-16600
- Thermal activity of the Uson Caldera based on infrared and photographic aerial survey. p0077 A73-39895
- Geological analysis of aerial thermography of the Canary Islands, Spain. p0077 A73-39896
- Aerial reconnaissance of oil spill in Gulf of Mexico with photographic, infrared and radar type systems [NASA-CR-117497] p0095 N71-21304
- Aerial photographic analysis of effects caused by coal combustion induced pollutants on Eastern white pine and vegetation p0101 N72-29363
- AERIAL RECONNAISSANCE**
- Aerial reconnaissance of oil spill in Gulf of Mexico with photographic, infrared and radar type systems [NASA-CR-117497] p0095 N71-21304
- Application of radiometric remote sensors for detecting oil slicks on water surface [AD-728551] p0098 N72-10402
- Effectiveness of remote sensor techniques for detecting oil films on water surface [AD-728422] p0098 N72-14478
- Aerial 35mm color photography for reconnaissance uranium exploration and soil and rock identification in Wyoming Tertiary basins p0100 N72-26334
- Bibliography on geothermal prospecting in arid and semiarid lands [PB-218830/8] p0109 N73-27359
- AERODYNAMIC CHARACTERISTICS**
- Aerodynamic problems in cooled turbine blading design for small gas turbine engines p0220 N69-26532
- AERODYNAMIC CONFIGURATIONS**
- Optimum configuration in large orbiting solar array design, considering configuration selection and environmental perturbations effects p0023 A68-16784
- AERONAUTICAL ENGINEERING**
- Air transport propulsion systems, discussing aircraft operating economics with reference to weight, size, powerplant efficiency, noise and air pollution p0008 A71-27542
- AERONAUTICS**
- Heat transfer research review, discussing gas turbines, aeronautics, astronautics, nuclear power, thermal pollution and controlled fusion challenges p0178 A72-23684
- AEROSATELLITE**
- Solar cell generator technology development based on German AEROS satellite project and work on roll-up structure, discussing module concepts and test results p0042 A73-22439
- AEROSOLS**
- Electrical conductivity of methane combustion products with aerosols [AD-685511] p0222 N69-29923
- AEROSPACE ENGINEERING**
- Alkali metal Rankine turbogenerator program for space power supplies, discussing power plant design, nuclear reactor, radiator materials, etc p0139 A68-45718
- Large solar array systems in space, discussing design and operation p0027 A69-35056
- Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications. [ASME PAPER 72-AERO-12] p0181 A72-43148
- Commercial space applications economics, discussing meteorological, navigational traffic control and communications satellites, nuclear waste disposal, space manufacturing, solar power generation, etc p0009 A72-45216
- Conference summary - selected NASA technology in electric power industry utilization p0012 N69-12586

- NASA development work on high efficiency batteries for space electric power systems [NASA-SP-172] p0265 N69-18042
- Development of integrated lightweight flexible silicon solar cell array [NASA-CR-110913] p0059 N70-43081
- Aerospace MHD large scale power generation p0250 N73-13865

AEROSPACE ENVIRONMENTS

- Optimum configuration in large orbiting solar array design, considering configuration selection and environmental perturbations effects p0023 A68-16784

AEROSPACE SYSTEMS

- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-282] p0018 N72-13391

AFRICA

- Geophysical survey of continental shelves off African coast and mapping for oil potential [PB-211393] p0103 N73-14400

AGRICULTURE

- ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee [E73-10694] p0108 N73-25386
- ERTS-1 imagery of landscape changes, strip mines, timber, agriculture, and water resources in eastern Tennessee [E73-10843] p0110 N73-28421

AIR

- Hydrazine-air fuel cells design features, auxiliary components and performance characteristics p0119 A68-13240

- Hydrazine-air fuel cell controls [AD-684339] p0221 N69-28781

AIR BREATHING ENGINES

- Air breathing hypersonic aircraft technology developments in propulsion systems and structures with emphasis on use of hydrogen fuel [AIAA PAPER 73-58] p0009 A73-17631
- Application and characteristics of cryogenic fuels for air breathing gas turbine engines p0118 N71-19463

- Design and development of auxiliary power unit and air breathing propulsion system for space shuttle vehicle p0095 N71-29603

- Design and development of air breathing engine system for space shuttle vehicle p0017 N71-29607

- Hydrocarbon fuels and fuel systems that meet cooling and propulsion requirements of advanced air breathing engines [AD-737372] p0100 N72-23806

- Analysis of major pollutants produced by aircraft engine exhaust and development of techniques to reduce level of pollutant emission [NASA-TM-X-68129] p0102 N72-32754

- Development and characteristics of hydrogen-based mobile fuel systems and analysis of technical and economic problems in large scale application [UCRL-51228] p0020 N73-16766

AIR CARGO

- Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields p0257 A73-33183

- Aircraft design for transporting arctic crude oil or liquid natural gas, examining air terminal requirements and handling specifications p0077 A73-41172

AIR CONDITIONING

- Theoretical analysis and experimental verification of two phase heat transfer characteristics of combined solar collector-auxiliary generator for solar air conditioner p0053 N69-17227

- Solar heating and air conditioning as energy conservation alternatives to nuclear power [NASA-TM-X-70468] p0022 N73-31990

AIR CONDITIONING EQUIPMENT

- Thermoelectric and ventilating system designs for use in protective military clothing [AD-737720] p0247 N72-24139

SUBJECT INDEX

AIRCRAFT DESIGN

- Technical and economic feasibility of solar powered space heating, air conditioning, and hot water heating systems for residential applications [NASA-CR-124063] p0066 N73-17911
- AIR POLLUTION**
- SST aircraft fuels and lubricants, discussing fire hazard and pollution minimization p0073 A70-29999
- Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality p0075 A72-28879
- Potential of hydrogen fuel for future air transportation systems. [ASME PAPER 73-ICT-104] p0010 A73-43499
- Relative dose factors from long period point source emissions of atmospheric pollutants p0011 N68-38380
- Plume diffusion measurements at medium range from continuous point source p0012 N68-38392
- Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology atomic energy industry [TID-24190] p0012 N69-17184
- Aerial detection of Co 60 fueled radioisotope thermoelectric generators [SC-TM-68-627] p0013 N69-19492
- NASA technologies considered for application to sulfur dioxide problem of air pollution [NASA-CR-100629] p0013 N69-39189
- Investigating petroleum products for capacity to absorb sulfur dioxide from industrial waste gases [NRL-RTS-5464] p0091 N70-20779
- Radioactive dust in air at KWR operation from fission production of fuels and activated aerosols [KURRI-TR-56] p0091 N70-21010
- Comparative emissions from leaded and prototype lead free automobile fuels [BMRI-7390] p0092 N70-28685
- Control techniques for sulfur oxide air pollutants [PB-190254] p0015 N70-34670
- Congressional hearings on air pollution control research in motor vehicle, aircraft, and diesel exhausts, and industrial and federal facilities wastes p0015 N70-36154
- Air pollution and automobile emission control efforts p0094 N70-39314
- Automobiles and air pollution, with internal combustion engine controls and alternative power plants p0016 N70-39315
- Aircraft fuel system fire safety and prevention, and jet aircraft air pollution p0094 N70-40779
- Senate subcommittee hearings on air and water pollution, including data on noise pollution and automobile fuel research p0016 N70-41770
- Senate subcommittee hearings on air and water pollution, including data on air quality standards and gasoline additive developments p0016 N70-41771
- Air pollution of fossil and nuclear power plants [CONF-700810-20] p0016 N71-13756
- Feasibility of large-scale terrestrial plants for future generation of pollution free electrical power from solar energy [NASA-TN-X-65497] p0061 N71-23700
- Factors relevant to development of fuels and energy policies compatible with environmental control p0016 N71-29471
- Deficiencies in combustion technology, and 5 year research and development plan for air pollution control by combustion process modification [PB-198066] p0017 N71-31900
- Developmental program for SO2, NO, and particulate pollutant level lowering and control in flue gas from fossil fuel combustion using fluidized beds with limestone [ANL/ES-CEN-1003] p0096 N71-36736
- Feasibility of using flywheel or flywheel-hybrid propulsion systems on automobiles and buses for air pollution reduction [PB-200143] p0266 N72-11410
- Prediction of effective stack height and corresponding ground level concentrations of effluents emitted from stack [FNL-PUBL-71-14] p0098 N72-16934
- Emission data for groups conducting air pollution inventories [AP-42-REV] p0099 N72-19686
- Correlation spectrometry from aircraft, balloons, and satellites applied to oil and mineral exploration and air pollution detection p0099 N72-23284
- Annotated bibliography on environmental pollution caused by aircraft emissions [AD-735943] p0099 N72-23655
- Aerial photographic analysis of effects caused by coal combustion induced pollutants on Eastern white pine and vegetation p0101 N72-29363
- Air pollutants in exhaust gas produced from LP-gas used in automotive engines [BM-RI-7672] p0101 N72-31768
- Analysis of major pollutants produced by aircraft engine exhaust and development of techniques to reduce level of pollutant emission [NASA-TM-X-68129] p0102 N72-32754
- Conversion and utilization of solar energy to solve energy shortages and pollution problems on earth p0066 N73-13866
- Alternate fuels to reduce aircraft exhaust pollutants [AD-755151] p0106 N73-20815
- Effects of transportation combustion products in air pollution [PB-213034] p0020 N73-20991
- Testing association of automotive fuel composition with exhaust reactivity using different engines and gasolines of varied composition [BM-RI-7756] p0109 N73-27542
- AIR PURIFICATION**
- Energy sources in US to achieve future electric energy needs and environmental compatibility requirements p0095 N71-29852
- AIR TRANSPORTATION**
- Power generation for civilian aircraft in second century of powered flight p0071 A68-43667
- Air transport propulsion systems, discussing aircraft operating economics with reference to weight, size, powerplant efficiency, noise and air pollution p0008 A71-27542
- Use of energy in transportation and implications for future [P-5025] p0113 N73-33921
- AIRBORNE EQUIPMENT**
- Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons p0027 A69-31287
- MHD power sources for onboard military aircraft electrical application p0167 A70-33474
- Megawatt fuel cells for aerospace applications. p0045 A73-29597
- Aerial infrared scanner to locate and detect subsurface coal fires p0086 N69-33683
- Remote airborne laser fluorosensor for sensing environmental pollution and hydrology [UTIAS-175] p0099 N72-20479
- AIRCRAFT DESIGN**
- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0072 A68-44975
- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0115 A69-43725
- Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials [ICAS PAPER 70-16] p0115 A70-84127

AIRCRAFT ENGINES

SUBJECT INDEX

- Civil transport aircraft future design trends, discussing subsonic, supersonic, hypersonic and V/STOL aircraft, engine design, fuels and noise reduction
p0076 A73-23682
- Aircraft design for transporting arctic crude oil or liquid natural gas, examining air terminal requirements and handling specifications
p0077 A73-41172
- ## AIRCRAFT ENGINES
- Materials and cooling of aircraft gas turbine engines noting nickel and tantalum alloys, turbine inlet temperatures, coatings, etc
p0122 A68-19791
- Potential in performance improvements in air breathing propulsion related to reliability, maintainability and cost
p0131 A68-33438
- Power generation for civilian aircraft in second century of powered flight
p0071 A68-43667
- Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption
[SAE PAPER 710369]
p0073 A71-24239
- Air transport propulsion systems, discussing aircraft operating economics with reference to weight, size, powerplant efficiency, noise and air pollution
p0008 A71-27542
- Market trends and technical progress in small gas turbine engines for general aviation and executive aircraft and helicopters
p0187 A73-34447
- Properties and limitations of chemical and nuclear fuels in aircraft engines
[AD-685535]
p0116 N69-29919
- Feasibility analysis of various fuels for aircraft engines
[AD-707178]
p0016 N70-37672
- Comparison of Wankel engine characteristics with small reciprocating and jet engines used as power plants in light aircraft
[REPT-908]
p0247 N72-20764
- Annotated bibliography on environmental pollution caused by aircraft emissions
[AD-735943]
p0099 N72-23655
- Analysis of factors influencing technical feasibility of operating aircraft on liquid hydrogen fuel
[NASA-TM-X-68242]
p0021 N73-24777
- ## AIRCRAFT FUEL SYSTEMS
- Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft.
p0009 A73-22830
- Tankage systems for methane-fueled supersonic transport
[NASA-TM-X-1591]
p0081 N68-23895
- Aircraft fuel system fire safety and prevention, and jet aircraft air pollution
p0094 N70-40779
- Alternate fuels to reduce aircraft exhaust pollutants
[AD-755151]
p0106 N73-20815
- ## AIRCRAFT FUELS
- Methane potentials as fuel for advanced aircraft, discussing performance, economy, combustion, heat transfer and handling
p0071 A68-33439
- Cost analysis of liquid hydrogen for aircraft fuel, considering production methods, plant capacity and technological advances
p0001 A68-33457
- Aircraft and industrial gas turbine fuel requirements and properties noting costs
p0071 A68-35741
- Power generation for civilian aircraft in second century of powered flight
p0071 A68-43667
- Commercial aviation gasolines inspection data tabulated and compared for 1969 and 1964
[SAE PAPER 700228]
p0073 A70-25897
- SST aircraft fuels and lubricants, discussing fire hazard and pollution minimization
p0073 A70-29999
- Soviet book on automotive and jet aircraft engine fuel chemical stabilizers under storage, transit and operational conditions, examining additives in relation to stability ratings
p0073 A71-17433
- Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption
[SAE PAPER 710369]
p0073 A71-24239
- Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination
p0074 A71-28754
- Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion
p0115 A71-44365
- Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality
p0075 A72-28879
- The use of hydrogen for aircraft propulsion in view of the fuel crisis.
p0009 A73-35469
- Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809]
p0009 A73-38373
- Potential of hydrogen fuel for future air transportation systems.
[ASME PAPER 73-ICT-104]
p0010 A73-43499
- Properties and limitations of chemical and nuclear fuels in aircraft engines
[AD-685535]
p0116 N69-29919
- Feasibility analysis of various fuels for aircraft engines
[AD-707178]
p0016 N70-37672
- Supersonic aircraft fuel technical requirements
p0094 N70-39640
- Fuel related problems in aircraft fuel systems, emphasizing hydrogen treated fuel
p0097 N72-11677
- Future aircraft fuel resource availability and pricing, processing methods, and economic projections for period 1970 to 2000
[NASA-TM-X-62180]
p0102 N72-32742
- Automatic controlled pressure system for onshore fueling of navy aircraft
[AD-748211]
p0267 N73-13997
- Analysis of factors influencing technical feasibility of operating aircraft on liquid hydrogen fuel
[NASA-TM-X-68242]
p0021 N73-24777
- ## AIRCRAFT INDUSTRY
- Cost analysis of liquid hydrogen for aircraft fuel, considering production methods, plant capacity and technological advances
p0001 A68-33457
- ## AIRCRAFT NOISE
- Civil aircraft future propulsion requirements, considering larger engine sizes, higher takeoff thrusts and lower noise levels
[CASI PAPER 72/10]
p0174 A71-37600
- ## AIRCRAFT PERFORMANCE
- Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809]
p0009 A73-38373
- Potential of hydrogen fuel for future air transportation systems.
[ASME PAPER 73-ICT-104]
p0010 A73-43499
- Advanced propulsion system effect on future rotary wing aircraft design
p0218 N69-23996
- ## AIRCRAFT SAFETY
- Aircraft fuel system fire safety and prevention, and jet aircraft air pollution
p0094 N70-40779
- ## AIRCRAFT STRUCTURES
- Air breathing hypersonic aircraft technology developments in propulsion systems and structures with emphasis on use of hydrogen fuel
[AIAA PAPER 73-58]
p0009 A73-17631

- Weight estimation and analysis of major structural components of hypersonic, liquid hydrogen fueled aircraft
[NASA-TN-D-6692] p0118 N72-18911
- AIRFRAME MATERIALS**
Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials
[ICAS PAPER 70-16] p0115 A70-44127
- AIRLINE OPERATIONS**
Hypersonic transports - Economics and environmental effects.
p0909 A73-34435
- ALABAMA**
Application of ERTS-1 MSS imagery to multidisciplinary investigations in Alabama
[E73-10509] p0107 N73-22284
ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386
- ALASKA**
ERTS-1 imagery of geosstructures of Alaskan continental crust and relation to mineral resources
[E73-10321] p0105 N73-18353
Air-cushion tankers for transporting Alaskan North Slope oil
[NASA-TM-X-2683] p0258 N73-18981
Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376
Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[PAPER-G30] p0109 N73-28261
Identification of geosstructures of continental crust in Alaska and relation to mineral resources and exploration
[E73-11035] p0112 N73-31339
- ALCOHOLS**
The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.
p0076 A73-25465
- ALGORITHMS**
Algorithms for optimization of transportation and storage in petroleum industry
p0257 N68-14618
- ALKALI METALS**
Electrostatic probe measurement in flowing NaK seeded Ar closed cycle MHD generators
p0132 A68-37310
Alkali metal Rankine turbogenerator program for space power supplies, discussing power plant design, nuclear reactor, radiator materials, etc
p0139 A68-45718
- ALKALINE BATTERIES**
Alkaline fuel cell development and trends, noting carbon dioxide removal technique and applications ranging from portable batteries to automobile power
p0180 A72-33887
High energy density silver-hydrogen cells for space and terrestrial applications.
p0188 A73-38403
Alternative power sources as replacements for mercury cells
[AD-675936] p0264 N69-11907
Design of prototype thermal battery incorporating pelletized alkaline heat source
[SC-RR-69-497-A] p0267 N73-21080
- ALKANES**
Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- ALPHA DECAY**
Utilization of neutron radiation from PuO₂ decay to provide spacecraft electric power
[NASA-CR-127045] p0101 N72-26528
- ALUMINUM**
Calorimetric, optical, and vibration investigation of stretch-formed aluminum solar concentrators for thermionic converters
[NASA-TN-D-4889] p0052 N69-10708
- ALUMINUM ALLOYS**
Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings
[NASA-TT-F-11659] p0048 N68-22401
- ALUMINUM COMPOUNDS**
High-efficiency Ga/1-x/Al/x/As-GaAs solar cells.
p0040 A73-10132
- AMMONIA**
Low cost nuclear energy for production of electrolytic ammonia
p0117 N70-14512
- AMMONIUM COMPOUNDS**
Uranium carbide preparation from uranium tetrafluoride, ammonium diuranate, and uranium trioxide studied to optimize production
[AI-CE-73] p0078 N68-11281
- ANALYSIS (MATHEMATICS)**
Electrode geometry effect on current and potential in magnetohydrodynamic generators
[IPP-3/68] p0207 N68-38458
- ANGULAR MOMENTUM**
Application of isotenoid flywheels to spacecraft energy and angular momentum storage
[NASA-CR-1971] p0266 N72-17020
- ANNULAR FLOW**
Annular induction MHD generators, giving input and output densities, electrical conversion efficiency, etc
p0139 A68-43072
Comparison of ASTM-A1 liquid fuel and natural gas fuels in annular turbojet combustor at Mach 3
[NASA-TM-X-52700] p0087 N70-12102
- ANTIREFLECTION COATINGS**
Development of a lightweight body-mounted solar cell array with a high power to weight ratio.
p0046 A73-38408
- APOLLO APPLICATIONS PROGRAM**
Electric power generation and cryogenic gas storage systems for Apollo applications program mission planning
[NASA-TM-X-61072] p0048 N68-23182
- APOLLO SPACECRAFT**
Hydrogen oxygen fuel cells for electric power plants and Apollo spacecraft
[DLR-MIT-70-09] p0239 N71-15723
- APPLICATIONS TECHNOLOGY SATELLITES**
Space applications research in astronomy and earth physics
[NASA-SP-331] p0021 N73-31867
- APPROXIMATION**
Approximative solution for charge cloud growth in electrofluid dynamic generator
p0216 N69-18445
Linear approximation of finite length magnetohydrodynamic induction converter
[UCRL-S0537] p0221 N69-28635
- AQUEOUS SOLUTIONS**
Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films.
[WSCI PAPER 72-27] p0075 A73-16687
- ARC DISCHARGES**
Russian book - Physical bases of thermionic energy conversion.
p0190 A73-41876
Direct current powered self repeating plasma accelerator with interconnected annular and linear discharge channels
[NASA-CASE-XLA-03103] p0240 N71-21693
- ARC HEATING**
Arc driven Hall MHD generator performance at strong MHD interaction parameters, noting channel stall as power limiting effects
p0127 A68-23921
Physical model for behavior of thermionic arc spots on MHD generator cathode
[NASA-TN-D-5414] p0224 N69-35732
- ARCHIPELAGOS**
Geological analysis of aerial thermography of the Canary Islands, Spain.
p0077 A73-39896
- ARCHITECTURE**
Lumiduc architecture for urban housing
[NASA-TT-F-14963] p0068 N73-26976

ARCTIC REGIONS

SUBJECT INDEX

ARCTIC REGIONS

Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields

p0257 A73-33183

Oil spread over Arctic ice, considering spread rate and oil slick size attainment for pollution potential during spills on tundra or pack ice [AIAA PAPER 73-701]

p0076 A73-36250

Arctic manpower, industrial, mineral, petroleum, and transportation resources [AD-716415]

p0094 A71-19770

ARGON

Argon discharges in metal capillary cathodes noting effects of electron density, flow velocity, electrode phenomena and gas temperature

p0143 A69-23450

Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition

p0190 A73-39619

Model study of magnetohydrodynamic generator using argon-potassium plasma [AD-728591]

p0246 A72-13698

ARGON PLASMA

Buildup time for nonequilibrium argon ionization at inlet of MHD generator channel

p0122 A68-19914

Diluent gas effect on alkali metal seeded rare gas nonequilibrium plasmas conductivity at various pressures, noting working fluid suitability in MHD generators

p0123 A68-20829

Potential distribution measurement in duct with propane/oxygen combustion gas flow in argon plasma MHD generator

p0128 A68-24872

Electrostatic probe measurement in flowing NaK seeded Ar closed cycle MHD generators

p0132 A68-37310

Potassium seeded argon plasma conductivity in induced electric field at static gas temperature for MHD generator model

p0141 A69-17909

Instabilities in K seeded Ar plasma in crossed electric and magnetic fields and with nonequilibrium ionization, noting effects on MHD generator characteristics

p0143 A69-23457

MHD generator performance operating on nonequilibrium Ar plasma with K additions in presence of electric fields

p0145 A69-23480

Preionization in Cs seeded Ar nonequilibrium plasma for MHD generators, examining discharge characteristics, recombination reactions, etc

p0168 A70-39991

Hall current effects in the Lewis magnetohydrodynamic generator.

p0184 A73-22823

Experimental investigation of the characteristics of a nonequilibrium MHD generator

p0190 A73-39618

Electric conductivity in argon potassium and helium potassium plasmas with elevated electron temperature in crossed electric and magnetic fields

p0190 A68-10892

Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics [AFOSR-68-0859]

p0202 A68-26537

Electric arcs in ionized and nonionized gas stream [SM-74/238]

p0213 A69-13347

Magnetoplasma dynamic converters with mercury vapor and argon [DLR-FB-69-85]

p0232 A70-26208

Measurements of potential and current density distributions in simulated Faraday-type MHD generator working with argon-potassium plasma [IPP-3/104]

p0234 A70-31285

ARID LANDS

Bibliography on geothermal prospecting in arid and semiarid lands [PB-218830/8]

p0109 A73-27359

AROMATIC COMPOUNDS

Aromatic hydrocarbon influence on lubricity of petroleum oils, noting mixtures with paraffins, low loads scuffing and decomposition

p0071 A68-41768

ARRAYS

Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides fabrication, costs, etc

p0028 A69-35708

Solar cell array fabrication methods extending operating temperature by pulsed spot welding techniques and deletion of adhesives

p0031 A70-12080

Design concepts for planetary solar array [NASA-CR-91730]

p0046 A68-14185

Effect of boost environment on design of large area solar array, its release and deployment on ground and in space, and electrical power source analysis [NASA-CR-95999]

p0051 A68-31404

Computer program developed to determine charged-particle irradiation effect on single solar cell power output [NASA-TN-X-63559]

p0054 A69-27843

Design criteria for integrated lightweight flexible silicon solar cell arrays [NASA-CR-106379]

p0056 A69-00952

Selection of materials and techniques for solar array design [ESRO-CR-12]

p0058 A70-30140

Development of technology for fabricating and integrating solar cell array into deployable system [NASA-CR-112002]

p0063 A72-13046

ARTIFICIAL SATELLITES

Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams

p0043 A73-22791

ASTRONAUTICS

Heat transfer research review, discussing gas turbines, aeronautics, astronautics, nuclear power, thermal pollution and controlled fusion challenges

p0178 A72-23684

ASTROPHYSICS

Space applications research in astronomy and earth physics [NASA-SP-331]

p0021 A73-31867

ATMOSPHERIC DIFFUSION

Plume diffusion measurements at medium range from continuous point source

p0012 A68-38392

Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology atomic energy industry [TID-24190]

p0012 A69-17184

ATOMIZERS

Cooling system based on vaporization of solar cell preheated solution drawn through chamber with atomizing injector

p0037 A72-24314

ATOMIZING

Thermoelectric generator design using ultrasonic atomizing burner and SiGe converter

p0121 A68-17827

ATTITUDE CONTROL

Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft

p0035 A71-27432

ATTITUDE INDICATORS

Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-282]

p0018 A72-13391

AUSTRALIA

Nuclear grade uranium dioxide powder production technology in Australia [CONF-690815-3]

p0090 A70-17649

AUTOMATIC CONTROL

Reliability optimization of automatic coal mining equipment [NASA-TN-X-61123]

p0081 A68-25716

Computerized simulation of optimal automatic control of coal treatment plant [AD-682791]

p0084 A69-26099

SUBJECT INDEX

BERYLLIUM

Computer controlled electrical measuring devices for thermoelectric generator of power plant [AD-727461] p0244 N71-38010

Automatic connection of aerogenerator to electrical network [NASA-TT-P-148731] p0106 N73-21238

AUTOMOBILE ENGINES

Soviet book on automotive and jet aircraft engine fuel chemical stabilizers under storage, transit and operational conditions, examining additives in relation to stability ratings p0073 A71-17433

Automobile gas turbine engine design [AD-694842] p0227 N70-14488

Technology review on electric automobiles p0266 N71-22199

Performance capabilities and cycle life of high specific energy batteries for pollution free electric vehicles [ANL-79531] p0267 N73-19061

AUTOMOBILES

Development status and feasibility of battery powered vehicles [PB-174982] p0193 N68-15499

Fuel cell-battery hybrid power source for electric cars [AD-662235] p0193 N68-15525

Fuel cell-battery hybrid power source for automobiles [AD-662236] p0193 N68-15641

Battery and fuel cell power sources for electric cars [ECON-2929] p0202 N68-23140

State-of-art in development of battery power sources for automobiles p0265 N69-34689

Primary energy storage and advanced flywheel configurations with application to urban electric vehicles [AD-697906] p0265 N70-22537

Comparative emissions from leaded and prototype lead free automobile fuels [BMRI-7390] p0092 N70-28685

Air pollution and automobile emission control efforts p0094 N70-39314

Automobiles and air pollution, with internal combustion engine controls and alternative power plants p0016 N70-39315

Senate Subcommittee hearings on air and water pollution, including data on noise pollution and automobile fuel research p0016 N70-41770

Feasibility of using flywheel or flywheel-hybrid propulsion systems on automobiles and buses for air pollution reduction [PB-200143] p0266 N72-11410

Coal gasification, gas purification, and catalytic methanation to produce high Btu automotive gas [TPR-49] p0099 N72-18760

AUXILIARY POWER SOURCES

Thermoelectric conversion of energy and radioisotope generators studied for selection criteria for power sources p0119 A68-14136

MHD power generation principles, considering increase of electric conductivity and stability p0121 A68-17797

MHD power sources for onboard military aircraft electrical application p0167 A70-33474

Hydrazine-fuelled battery low power consumption auxiliary system with voltage regulator and gas pumps p0170 A70-43539

Large area silicon solar array development. p0044 A73-29593

Long-life light weight reliable fuel cell development for long term space missions power supplies, describing system components and construction materials p0044 A73-29596

Megawatt fuel cells for aerospace applications. p0045 A73-29597

NASA educational facts on present and future electric power sources for space application [NASA FACTS-NF-38] p0048 N68-19128

Development of nuclear thermionic space power system using thermionic diodes, and heat pipe flow for temperature control [NASA-TN-D-4299] p0200 N68-19146

Geometric properties of expandable whirling membrane solar energy concentrator used in conjunction with electrical conversion systems for spacecraft auxiliary power units [NASA-TN-D-4532] p0048 N68-22258

Lecture series on energy conversion and systems engineering for space power sources [AGARDOGRAPH-123-PT-11] p0228 N70-16217

Design and development of auxiliary power unit and air breathing propulsion system for space shuttle vehicle p0095 N71-29603

Development of PuO₂-Mo fuel disks for electric space power [LA-4697] p0097 N72-12617

B

BACTERIA

Decontamination of petroleum products with honey [NASA-CASE-XNP-03835] p0095 N71-23499

BALLISTICS

Performance characteristics of electro-ballistic generators for fluid dynamic energy into electric energy p0198 N68-17816

BALLOON SOUNDING

Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons p0027 A69-31287

Technological evolution of solar generators for terrestrial applications and sounding balloons, discussing environment caused problems and solutions, energy cost estimate and future prospects p0042 A73-14253

Mechanical, electrical, environmental, and launch simulation tests of Eole balloon solar generators [NASA-TT-P-13836] p0063 N72-14032

BALLOONS

Fuel cells and microwave equipment of balloon electrical power systems [AD-682898] p0219 N69-25803

BARIUM

Thermionic energy conversion with a Ba-Cs-diode. p0180 A72-34603

BARRELS (CONTAINERS)

Safety criteria for nuclear fuel transport p0257 N69-37570

BATTERY CHARGERS

High-efficiency converter and battery charger for an RTG power source. p0190 A73-42906

Solar charger kit for nickel cadmium battery of integrated observation system [AD-734809] p0063 N72-19066

BAYES THEOREM

Bayesian decision theory, discussing choice of possible systems to convert wind into electrical energy p0074 A71-33291

BAYS (TOPOGRAPHIC FEATURES)

Pollution hazards from petroleum industries and shipping in Delaware Bay p0104 N73-16948

BEEES

Decontamination of petroleum products with honey [NASA-CASE-XNP-03835] p0095 N71-23499

BELGIUM

Research on electrofluid dynamic energy conversion in Belgium p0216 N69-18446

BELLOWS

Unitized bellow radioisotope thermoelectric generator concept for long term stability, using standardized design, fabrication and qualification [ASME PAPER 71-WA/ENER-1] p0177 A72-15940

BERYLLIUM

Preliminary design, fabrication, and test of lightweight solar panel of built-up beryllium structure with 29 sq ft active cell area [NASA-CR-117349] p0061 N71-20727

BETA PARTICLES

- High voltage generation with beta electrogenerator cell
[NASA-TN-X-52776] p0232 N70-26116
- BIBLIOGRAPHIES**
- Annotated bibliography on batteries, fuel cells, thermionics, thermoelectrics, nuclear energy sources, and other direct energy conversion concepts adaptable to space vehicles
[NASA-TN-X-60877] p0195 N68-17223
- References on magnetohydrodynamic generators
[AD-686000] p0222 N69-32347
- Compilation of references on direct conversion of heat into electrical energy
[BLG-427] p0223 N69-32934
- Oil spill incidents and oil pollution effects on biological systems and earth ecology bibliography
[PB-188206] p0014 N70-21569
- Annotated bibliography on solar cells and panels
[AD-700500] p0058 N70-29273
- Annotated bibliography on environmental pollution caused by aircraft emissions
[AD-735943] p0099 N72-23655
- Bibliography on controlled fusion and plasma physics
[TID-3557-1971-SUPPL] p0250 N73-12785
- Bibliography on applications of nuclear explosions in mines, chemistry, and gas and oil extraction
[CEA-BIB-129-ADD-1] p0104 N73-17719
- Bibliography on geothermal prospecting in arid and semiarid lands
[PB-218830/8] p0109 N73-27359
- Review of resources of fossil and nuclear fuels, solar energy and hydroelectric power
[LRP-63/73] p0021 N73-30975
- Cumulative bibliography of research and development projects conducted on heat pipe technology and applications
[NASA-CR-135953] p0258 N73-33900
- Bibliography of research projects on heat pipe, development, performance, and application - January through March, 1972
[NASA-CR-135956] p0258 N73-33901
- Bibliography of heat pipe research and development projects conducted during April through June 1972
[NASA-CR-135955] p0259 N73-33902
- Bibliography of heat pipe research and development projects conducted during July through September, 1972
[NASA-CR-135952] p0259 N73-33903
- Supplemental report and bibliographies of heat pipe research projects conducted during calendar year 1971
[NASA-CR-135951] p0259 N73-33904
- BIOCHEMICAL FUEL CELLS**
- State-of-the-art review on thermodynamics and applications of bioelectrochemical energy conversion processes
p0199 N68-17826
- BIOCHEMISTRY**
- Bioelectrochemical energy conversion, discussing applications for toxic material identification, powering cardiac pacemakers and electric power generation
[AGARDOGRAPH 81] p0125 A68-22545
- Biological conversion of solar energy, discussing photosynthesis and nonphotosynthesis mechanisms
p0032 A70-31600
- BIOELECTRICITY**
- Bioelectrochemical energy conversion, discussing applications for toxic material identification, powering cardiac pacemakers and electric power generation
[AGARDOGRAPH 81] p0125 A68-22545
- BIOLOGICAL EFFECTS**
- Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- BIOSYNTHESIS**
- Literature survey on properties of microbiological synthesis of protein substances from petroleum hydrocarbons
[JPBS-48150] p0084 N69-29789
- BIOTITE**
- Sierra Nevada granite halos in biotite nuclei, discussing relation between biotite zircon content and halo production
p0071 A68-23286

BISMUTH TELLURIDES

- Thermoelectric nuclear batteries fabrication in milliwatt power range combining bismuth telluride thermopiles with plutonia fuel capsules
p0188 A73-38410

BITUMENS

- 17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734

BLACK KNIGHT ROCKET VEHICLE

- Electron bombardment ion engine having 0.015 N thrust, 30 km/sec exhaust velocity, and 550 W deployable solar array proposed for Black Arrow X5 spacecraft
[RAE-TR-68191] p0054 N69-24137

BLANKETS

- Fast breeder reactor design considerations of blanket cycle efficiency and management
p0086 N69-31987

BOILERS

- Artificial circulation system for heat transfer from subsurface porous layers by underground boilers
p0089 N70-16585
- Filtration of heat carriers in earth core rocks at depths from 6 to 8 kilometers
p0090 N70-16588
- Cost analysis for geothermal boiler installation for mining thermal heat sources
p0090 N70-16590

BOOMS (EQUIPMENT)

- Performance test on rollup solar array system and thermal bending tests on deployable boom
[NASA-CR-118006] p0061 N71-23714

BOUNDARY LAYER FLOW

- Combustion driven Hall configuration MHD generator, discussing boundary layer analysis, gas density nonuniformity and electrode drop
p0168 A70-40003

BOUNDARY LAYER SEPARATION

- Arc driven Hall MHD generator performance at strong MHD interaction parameters, noting channel stall as power limiting effects
p0127 A68-23921

BOUNDARY LAYER STABILITY

- Magnetohydrodynamic flow in MHD ducts from point of view of boundary layer and shock wave theory
p0219 N69-26242

BOUNDARY LAYERS

- Electrode and boundary layer temperature effects on combustion driven MHD generator, discussing generator configuration
p0126 A68-23911
- Electrode and boundary layer temperature effects on MHD generator performance, investigating energy transfer from working fluid to external load
p0132 A68-39715

- Electrical effects of boundary layers on insulator wall of MHD generator, considering equilibrium and nonequilibrium ionization generators performance
p0164 A70-19321

- Electrode size effects on voltage loss and boundary layer conductivity of combustion driven MHD generator
p0173 A71-29880

- Magnetohydrodynamic flow, boundary layers, and plasma diagnostics in MHD ducts
[JPBS-48041] p0219 N69-26241

- Calculation of boundary layer at electrode of MHD generator
p0219 N69-26243

- Boundary layer influence and other effects on magnetohydrodynamic generator electrical characteristics
[AD-685536] p0221 N69-29842

- Circuit substitution and calculation procedure for determining influence of boundary layer on MHD generator electrical characteristics
[AD-745245] p0249 N72-33063

BRAYTON CYCLE

- Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization
p0131 A68-31228

SUBJECT INDEX

BUOYS

Thermodynamic comparison of MHD generators using
Brayton and Rankine cycles, showing Rankine
cycle conversion at higher channel Mach numbers
for nonequilibrium ionization p0140 A69-14154

Rankine cycle technology concerning high
temperature, refractory alloy and liquid metal
experience, showing applicability to nuclear
Brayton and thermionic power systems p0163 A70-12513

Brayton, Hg, organic-Rankine and potassium-
Rankine dynamic space power systems for use with
nuclear energy sources p0166 A70-29492

NERVA reactor technology applied to closed Brayton
cycle MHD power system p0170 A70-45956
{AIAA PAPER 70-1225}

Electrically-heated Brayton power conversion
system, comparing performance tests with
prediction p0173 A71-32212

Brayton cycle power conversion system using He-Xe
gas mixture, discussing compressor net engine
and turbine static efficiencies p0175 A71-38908

Electrical subsystem of 2-15 kW Brayton power
conversion system consisting of speed
controller, alternator voltage regulator, DC
power supply, etc p0175 A71-38910

Design point characteristics of a 500 - 2500 watt
isotope-Brayton power system. p0182 A73-13388
{AIAA PAPER 72-1059}

Isotope Brayton space power systems and their
technology. p0183 A73-20467

Isotope Brayton electric power system for the 500
to 2500 watt range. p0184 A73-22793

Brayton cycle solar dynamic turboalternator space
electric power system technology developments
during 1962-1972, considering power efficiency,
components reliability and future missions p0185 A73-25982

Evaluation testing of a closed Brayton-cycle
electrical-power-conversion system. p0185 A73-25983

A power and load priority control concept as
applied to a Brayton cycle turbo-electric
generator. p0186 A73-25984

Feasibility analysis of satellite solar/thermal
power generation and transmission to earth,
describing Brayton cycle heat engine for initial
energy conversion p0046 A73-38404

Working gas selection for closed Brayton cycle
turbocompressor for space power applications p0196 N68-17802

Breadboard model of Brayton cycle alternator and
voltage regulator-exciter p0204 N68-29960
{NASA-TN-D-4697}

Design and testing of 1200-Hz alternator and
voltage and frequency controls for Brayton space
power systems p0205 N68-31042
{NASA-TN-X-52453}

Solar and radioisotope Brayton cycle power supplies
{NASA-TN-X-52438} p0051 N68-31096

Transient solidification outside cooled pipe with
application to solar Brayton heat receiver p0052 N69-10227
{NASA-TN-D-4897}

Design, manufacture, and testing of parasitic load
resistors for Brayton power conversion system p0208 N69-10335
{NASA-CR-72436}

Gas turbine engine principles, performance
improvements, and application to electric power
generation based on NASA technology p0208 N69-12578

Criticality calculations for plutonium oxide
radioisotope heat source p0082 N69-15081
{MLM-1532}

Comparison of Brayton and Rankine cycle
magnetohydrodynamic space power generation systems
for use with nuclear heat source p0217 N69-20852
{NASA-TN-D-5085}

Thermoelectric, thermionic, and Brayton conversion
devices for radioisotopic power generators p0223 N69-32804
{AD-687131}

Preliminary design and performance considerations
for 25 kW Pu 238 heat source Isotope Reentry
Vehicle p0223 N69-34989
{NASA-CR-72555}

Electrothermal instabilities effects on Brayton
and Rankine cycle magnetohydrodynamic space
power generation systems p0224 N69-37883
{NASA-TN-D-5461}

Turbine performance in gas-bearing Brayton cycle
turboalternator p0227 N70-14220
{NASA-TN-D-5604}

Performance tests of 2-15 kilowatt Brayton power
system using krypton p0229 N70-19190
{NASA-TN-X-52750}

Development of regenerator for use as Brayton
cycle space power system using solar energy p0057 N70-20627
{NASA-CR-108945}

Brayton cycle power system using dc power supply
for space applications p0236 N70-36860
{NASA-CR-72529}

Design and testing of lithium fluoride cavity
receivers for solar power conversion systems p0237 N70-42202
{NASA-CR-54752}

Comparison of Brayton cycle power plant and fuel
cell for underwater vehicles p0238 N70-42951
{AD-709387}

Transfer functions for primary loop of conceptual
nuclear Brayton space power plant p0240 N71-17933
{NASA-TN-X-2193}

Steady state and transient operating
characteristics of lithium cooled primary flow
loop of nuclear Brayton space power plant p0240 N71-18866
{NASA-TN-X-2161}

Comparison of turbo-MHD cycle with Brayton-MHD and
turboelectric cycles p0241 N71-24578
{NASA-TN-X-67829}

Design, development, and performance of 35 to 150
kilowatt Brayton power conversion module and
application to nuclear reactor powered system p0243 N71-35233
{NASA-TN-D-6525}

Development of combined
turbine-magnetohydrodynamic generator operating
in Brayton cycle with NERVA nuclear reactor for
space and ground applications p0244 N71-36450
{NASA-TN-D-6513}

Power and load priority control concept for Brayton
cycle power system providing speed control and
field current control for alternator and load
simulation which includes energy storage p0244 N71-36452
{NASA-TN-D-6478}

BREADBOARD MODELS

A power and load priority control concept as
applied to a Brayton cycle turbo-electric
generator. p0186 A73-25984

Advanced fuel cell breadboard model and component
testing p0191 N68-11030
{NASA-CR-90210}

Breadboard model of Brayton cycle alternator and
voltage regulator-exciter p0204 N68-29960
{NASA-TN-D-4697}

Analysis and breadboarded performance of parallel
energy storage units for power systems p0266 N71-17471
{NASA-CR-116510}

BREEDER REACTORS

Nuclear research and power plant developments in
various countries, and operating experience with
fast reactors and breeder reactors p0010 N68-10725
{JPRS-43265}

Fuel cycle costs for varying designs of gas cooled
fast breeder reactors p0081 N68-29161
{GA-8032}

Fast-breeder reactors as heat sources for nuclear
electric power generation based on NASA-DERIVED
technology p0012 N69-12576

Nuclear power plants for low cost heat and
electricity generation p0014 N70-14505

BUILDINGS

Lunatic architecture for urban housing p0068 N73-26976
{NASA-TT-P-14963}

BUOYS

Eole monitoring of drifting buoys and balloons in
Southern Hemisphere for oceanographic and
meteorological data p0100 N72-25345
{NASA-TT-P-14279}

BURNERS

Thermoelectric generator design using ultrasonic atomizing burner and SiGe converter

p0121 A68-17827

BURNOUT

EQUICORE - space dependent code written in FORTRAN 4 assessing nuclear and thermal performance in reactors
[TRG-1808]

p0230 N70-22307

C

CADMIUM SELENIDES

Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide, discussing preparation methods and photoelectric and electric properties

p0033 A70-36238

Photoelectric solar converter using cadmium sulfide and cadmium selenide tablets or thin films
[AD-756594]

p0067 N73-21960

CADMIUM SULFIDES

CdS thin film solar cell noting advantages over silicon photovoltaic cells for converting light into electric energy

p0024 A68-34613

Cadmium sulfide thin film solar cell design for space applications

p0025 A68-42518

Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons

p0027 A69-31287

Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc

p0028 A69-42271

Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc

p0031 A70-15329

Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide, discussing preparation methods and photoelectric and electric properties

p0033 A70-36238

CdS thin film solar cells, describing manufacture for increased degradation resistance

p0033 A70-43537

CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption

p0034 A71-11896

Integrated high voltage CdS solar batteries with interconnected cells in series without grid

p0034 A71-16058

Solar to electric energy conversion efficiency and electrical properties of photoconverters using compressed sintered CdS

p0036 A71-44390

Thin film Cu-CdS solar cell electrochemical plating potential and solution composition effects on copper sulfide surface layer formation and cell efficiency

p0038 A72-28008

Improved efficiency of cadmium sulfide-copper sulfide thin film solar cells, noting optimization of layer formation, gridding and encapsulation

p0038 A72-28016

High efficiency Cu₂S-CdS-solar cells with improved thermal stability.

p0041 A73-14216

New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell.

p0041 A73-14220

Investigations of the inhomogeneity of polycrystalline Cu_xS-CdS solar cells.

p0041 A73-14222

Historical development of solar cells.

p0044 A73-29590

Development and testing of cadmium sulfide thin film solar array subpanels

p0051 N68-33207

Plastic substrate, cadmium sulfide thin film solar cell

p0054 N69-23369

Radiation damage on silicon solar cells - development of cadmium telluride and cadmium sulfide cells

p0055 N69-35592

Flight testing of cadmium sulfide thin film solar cells for stability and efficiency
[AD-723315]

p0062 N71-31939

Tests of cadmium sulfide solar cells under simulated space environmental conditions
[NASA-CR-120840]

p0063 N72-14029

Photoelectric solar converter using cadmium sulfide and cadmium selenide tablets or thin films
[AD-756594]

p0067 N73-21960

CADMIUM TELLURIDES

Cadmium telluride photocells, discussing performance and mass production

p0167 A70-38481

New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell.

p0041 A73-14220

CdTe thin film fabrication by direct synthesis of vacuum evaporated Cd and Te, noting solar cell efficiency increase after storage in room temperature exsiccator

p0045 A73-30475

Technology for fabricating cadmium telluride solar photoelectric cells with improved energy conversion efficiency

p0050 N68-28744

Radiation damage on silicon solar cells - development of cadmium telluride and cadmium sulfide cells

p0055 N69-35592

CALCULUS OF VARIATIONS

Analysis of optimal conditions for energy conversion in an MHD-generator channel

p0182 A73-16586

Direct current and electrodeless induction type magnetohydrodynamic power generators using liquid metals as working media optimized by means of variational calculus
[DLR-FB-67-71]

p0193 N68-14746

CALIBRATING

Standard solar cells calibrated in respect of air mass zero short circuit current

p0059 N70-30232

CALIFORNIA

ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California
[E73-10478]

p0107 N73-21315

CANADA

Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics

p0084 N69-30776

Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414]

p0105 N73-20376

Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[PAPER-G30]

p0109 N73-28261

CAPILLARY TUBES

Argon discharges in metal capillary cathodes noting effects of electron density, flow velocity, electrode phenomena and gas temperature

p0143 A69-23450

CAPSULES

Heat transfer from radioisotope capsules buried in porous materials
[AD-691213]

p0225 N69-40031

CARBOHYDRATES

Decontamination of petroleum products with honey
[NASA-CASE-XNP-03835]

p0095 N71-23499

CARBON

Carbon fuel cell technology, describing manufacturing processes for three types of carbon electrodes

p0139 A68-44779

Catalytic load carrying capacity of porous carbon electrodes impregnated with nickel salt and nickel boride in anodic fuel cell hydrazine oxidation

p0164 A70-24469

CARBON DIOXIDE CONCENTRATION

Hydrogen depolarized fuel cell for space station prototype carbon dioxide concentrator, describing modular design concept and operation [ASME PAPER 71-AV-37] p0174 A71-36404
The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel p0075 A73-12955

CARBON DIOXIDE LASERS

Thermionic emission characteristics of W and Mo subjected to focused CW carbon dioxide laser radiation, discussing direct energy conversion p0162 A70-12068

CARBON DIOXIDE REMOVAL

Alkaline fuel cell development and trends, noting carbon dioxide removal technique and applications ranging from portable batteries to automobile power p0180 A72-33887

CARBONATES

Molten carbonate fuel cell and molten electrolyte battery for electrically and thermally efficient power source with fast transient response [AD-692538] p0226 N70-10447

CARGO

Energy used in intercity freight transportation by water, rail, pipeline, truck, and air, and effect of fuel price increases [R-804-NSP] p0258 N72-23979
Fuel consumption profiles of passenger and freight transportation modes [P-4935] p0021 N73-23962

CARGO AIRCRAFT

Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions [AIAA PAPER 70-1221] p0008 A71-22779

CARNOT CYCLE

Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0171 A71-16785
Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0174 A71-33037

CASES (CONTAINERS)

Leak testing of containers and capsules for radioactive materials [NLL-RISLEY-TPANS-1865-/9091.9F] p0091 N70-20349

CATALYSIS

Catalysis in electrochemical energy conversion p0199 N68-17823

CATALYSTS

Design and development of 1.5 kilowatt fuel cell powerplant for field use [AD-730796] p0246 N72-14040

CATALYTIC ACTIVITY

Packed bed catalytic reactors cooling capacity in promoting endothermic reactions of hydrocarbon fuels, using computerized temperature and composition profiles [AIAA PAPER 69-588] p0072 A69-33265
Molten carbonate fuel cells power source for military applications, considering catalytic recycle reformer p0164 A70-20703

Catalytic load carrying capacity of porous carbon electrodes impregnated with nickel salt and nickel boride in anodic fuel cell hydrazine oxidation p0164 A70-24469

CATHODES

Hollow cathode operation and plasma discharge in mercury ion engine, potential distribution of glow discharge, and liquid metal MHD power conversion p0214 N69-16485
Rotating disks, current and potential distribution in cylindrical geometries, foaming electrolyte fuel cell, and iodine cathode p0223 N69-34813

CAVITIES

High temperature solar energy converter cavity absorbers geometry, considering absorption parameters of radiation reflected by concentrator p0030 A70-10761

CELL ANODES

Catalytic load carrying capacity of porous carbon electrodes impregnated with nickel salt and nickel boride in anodic fuel cell hydrazine oxidation p0164 A70-24469

CENTRIFUGAL COMPRESSORS

High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature p0172 A71-24218

CERAMICS

Performance characteristics and limitations of electrode and insulation materials for open and closed cycle MHD generators, noting ceramic compositions for channel [AD-737019] p0178 A72-22401
Ceramics replacement for Ni-Cr superalloys to improve automotive gas turbine performance by increasing inlet temperature, considering material selection p0187 A73-31250
Study of metallic and ceramic electrodes in MHD generator [SM-74/62] p0210 N69-13315
Chemical, X ray diffraction, electron microscopic, and structural analysis of silicon carbide ceramics for open cycle magnetohydrodynamic generators p0243 N71-35623

CESIUM

Preionization in Cs seeded Ar nonequilibrium plasma for MHD generators, examining discharge characteristics, recombination reactions, etc p0168 A70-39991
Thermal-to-electric power conversion efficiency of nonequilibrium MHD generator with Cs seeded noble gases, considering electrode configuration and gas dynamic effects p0179 A72-29356
Thermionic energy conversion with a Ba-Cs-diode, p0180 A72-34603
Electrical resistivity of liquid lithium saturated with cesium [NASA-CR-110370] p0233 N70-29729
Development of cesium seeding techniques, large MHD magnets, plasma diagnostic techniques, and thermionic electrodes compatible with shock tube MHD generators [AD-711351] p0238 N71-10992
MHD generator for measuring conductivity of hydrocarbon-oxygen combustion gases seeded with cesium salts [AD-725739] p0245 N72-11065
Generation of MHD power with cesium seeded inert gas through use of nonequilibrium ionization [NASA-TN-X-67975] p0246 N72-12166
Feasibility of potassium-cesium mixture for seeding magnetohydrodynamic combustion plasma [PB-214314/7] p0253 N73-25102

CESIUM DIODES

Diminide-diode for improving performance of nuclear thermionic systems [NASA-TN-X-2586] p0248 N72-28685

CESIUM PLASMA

Mercury cesium plasma in crossed electric and magnetic fields as working fluid of MHD generators based on Rankine cycle p0143 A69-23458
Electric arcs in ionized and nonionized gas stream [SM-74/238] p0213 N69-13347
Properties of mercury cesium plasma in crossed electrical and magnetic fields [SM-107/130] p0214 N69-15430
Measurements of plasma parameters in simulated thermionic converter with cesium plasma for spacecraft use p0245 N72-10852

CESIUM VAPOR

Radiation effects on Cs thermionic converter, discussing radiation interaction with alkaline atoms to complete space charge neutralization by supplementary ion creation p0026 A69-29261

CHANNEL FLOW

Electrode end effects on plane flow of electrically conducting fluid in MHD generator, determining current and electrical potential functions p0120 A68-16360

MHD channel flow approximation calculation for determining optimal MHD power generation conditions p0122 A68-18450

Plasma flow in MHD generator channel with series connected electrodes analyzed to select flow regimes p0122 A68-19561

Two terminal operation of diagonal conducting wall and Hall generators under identical gas dynamic channel entrance conditions and magnetic field configurations p0127 A68-23920

Arc driven Hall MHD generator performance at strong MHD interaction parameters, noting channel stall as power limiting effects p0127 A68-23921

Potential distribution in channel of liquid metal conduction MHD machine, examining electromagnetic channel pressure p0130 A68-29187

Optimization of linear conduction MHD generator with constant cross sectional area channel p0130 A68-30712

Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization p0131 A68-31228

Two terminal operation of diagonal connecting wall /DCW/ and Hall MHD generators under identical gasdynamic channel entrance conditions and magnetic field configurations p0132 A68-39717

Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization p0140 A69-14154

Optimum operation modes of MHD converter p0142 A69-23095

One dimensional calculations of finite length MHD uniform traveling wave induction generator, discussing magnetic field distribution, electrical impedance and conversion efficiency p0149 A69-27494

MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters p0149 A69-27499

Rayleigh-Taylor instability in synchronous liquid metal MHD generators, showing stabilization by channel positioning and threshold power rating p0150 A69-27508

Optimal MHD generator with constant channel area, assuming small Reynolds numbers and ideal inviscid gas with arbitrary electrical conductivity p0164 A70-24570

MHD generator with generator channel consisting of two coaxial cylinders with smooth annular space, discussing internal impedance sensitivity p0165 A70-24855

Conducting wall MHD generator channel current distribution, examining computer program for anode and cathode currents p0169 A70-40013

Optimal load circuits number for maximum power extraction from Hall MHD generator with nonuniform gas flow along channel p0170 A70-44900

Qualitative analysis of MHD energy conversion efficiency p0186 A73-27321

Phase impedance, power factor, performance characteristics, and working fluids studied for magnetohydrodynamic generators p0204 A68-29990

Research and advanced concepts - laminarization in nozzle flow, liquid metal magnetohydrodynamic power conversion, swirling and nonswirling gas flow, magnetic field effects in square channel p0207 A68-37410

Electrical parameter calculation for magnetohydrodynamic generator with variable gas parameters along channel axis [INR-1107] p0235 A70-33335

CHARGE DISTRIBUTION

Electrostatic energy converter load current analysis, deriving expression for space charge electric field with axially varying or constant charge distribution p0165 A70-25036

CHARTS

Viscosity-temperature chart for hydrocarbons permitting linear extrapolations into low viscosity high temperature regions p0072 A69-23975

CHEMICAL ANALYSIS

Minerally entrapped fatty acids analyzed after demineralization liberation of exhaustively extracted oil shale from Green River Formation p0071 A68-27231

Chemical, X ray diffraction, electron microscopic, and structural analysis of silicon carbide ceramics for open cycle magnetohydrodynamic generators p0243 A71-35623

CHEMICAL AUXILIARY POWER UNITS

Secondary cells with liquid lithium anodes and immobilized fused salt electrolytes p0262 A69-15330

Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources p0174 A71-34227

H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report. [IEEC PAPER 739028] p0116 A73-38436

Construction, operation, and applications of fuel cells to show advantages and limitations [NASA-SF-5115] p0253 A73-26045

CHEMICAL COMPOSITION

Computerized calculation of gas turbine cycles thermal efficiency, using hydrocarbon fuel, considering fuel composition and heat of combustion changes p0073 A70-43439

Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah. p0076 A73-25471

CHEMICAL ENERGY

Book on energy conversion statics covering state functions, quasi-static processes, internal energy, chemical energy storage and conversion, dynamics and postulates and laws p0166 A70-27670

Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0171 A71-16785

Chemical energy conversion into mechanical work, examining irreversible mixing, van Hoff box and Carnot cycle p0174 A71-33037

Thermal or chemical energy conversion to electromagnetic radiation by laser, discussing atomic or molecular processes and thermodynamic limitations p0176 A71-38939

Reversible thermodynamic cycle of chemical to electric energy conversion with electron gas as working body, discussing Gibbs-Helmholtz equations p0180 A72-32994

General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power [FTD-MT-64-355] p0203 A68-26786

Physical and technical problems of direct conversion of chemical energy into electrical [AD-696497] p0229 A70-18341

CHEMICAL ENGINEERING

Low cost nuclear power for acetylene manufacture p0117 A70-14509

CHEMICAL EQUILIBRIUM

Composition and thermodynamic properties of
combustion products of methane and air-oxygen
[SM-74/217] p0082 N69-13334

CHEMICAL FUELS

The impact of aerospace technology on energy
conversion in the 70's.
[ASME PAPER 72-AERO-11] p0008 A72-43147

Magnetohydrodynamic problems in transformation of
energy
[AD-699661] p0231 N70-25577

CHEMICAL LASERS

Laser energy absorption by plasma for controlled
thermonuclear fusion, comparing uses of
electrically pumped gas, chemical and solid
state lasers
p0187 A73-35379

CHEMICAL PROPERTIES

Development of isotopic power fuels for use at
temperatures up to 2000 C
[ORNL-4750] p0100 N72-24703

CHEMICAL PROPULSION

Japanese research and development progress in
energy conversion and chemical propulsion
[AD-739325] p0248 N72-27067

CHEMICAL REACTIONS

Chemical power conversion to mechanical or
electrical energy noting relation to temperature
limits of heat for heat engine
p0123 A68-20734

Chemically regenerative fuel cells, discussing
competitiveness with direct fuel cells
p0129 A68-27650

Analysis of rate of oxidation of petroleum
products in water under conditions where
nitrogen, phosphorous, and potassium are present
[NLL-NSTIC-TRANS-2474-(6180,59)] p0097 N71-37701

CIRCUIT RELIABILITY

German monograph on thermionic power supply
equipment converter network reliability covering
I-V characteristics and failure probability
calculation
p0177 A72-15696

CIRCUITS

Optimal load circuits number for maximum power
extraction from Hall MHD generator with
nonuniform gas flow along channel
p0170 A70-44900

Circuit substitution and calculation procedure for
determining influence of boundary layer on MHD
generator electrical characteristics
[AD-745245] p0249 N72-33063

CIRCULATION

Low cost energy for sewage water processing and
reuse
p0014 N70-14519

CITIES

Review and description of transferable
technologies to near future
[PB-178271] p0011 N68-31703

Nuclear power plant energy for heating urban center
p0227 N70-14518

CIVIL AVIATION

Power generation for civilian aircraft in second
century of powered flight
p0071 A68-43667

Commercial aviation gasolines inspection data
tabulated and compared for 1969 and 1964
[SAE PAPER 70C228] p0073 A70-25897

Civil aircraft future propulsion requirements,
considering larger engine sizes, higher takeoff
thrusters and lower noise levels
[CASI PAPER 72/10] p0174 A71-37600

Civil transport aircraft future design trends,
discussing subsonic, supersonic, hypersonic and
V/STOL aircraft, engine design, fuels and noise
reduction
p0076 A73-23682

CLOSED CYCLES

Closed cycle plasma MHD systems, discussing
nonequilibrium ionization, reactor economics,
performance and requirements
p0126 A68-22960

Closed cycle MHD experimental facility
characteristics, discussing seeding, Faraday and
Hall voltage measurements and plasma conductivity
p0127 A68-23929

MHD generator and compressor Joule losses effect
on thermoelectric energy conversion closed cycle
efficiency with electrical conductivity
maintained by nonequilibrium ionization
p0131 A68-31226

High effective electrical conductivity and power
densities in closed cycle MHD power generation,
considering effect of local nonequilibrium
ionization
p0133 A68-40538

Closed-loop cycle converter, composed of MHD
generator and compressor consuming thermal
energy, exhibiting moderate cycle efficiency
decreases
p0134 A68-41272

MHD generator and compressor Joule losses effect
on thermoelectric energy conversion closed cycle
efficiency with electrical conductivity
maintained by nonequilibrium ionization
p0140 A69-14152

MHD electrical power generation - Conference,
Warsaw, July 1968, Volume 1, Closed cycle MHD
with gaseous working fluids
p0001 A69-23433

Closed cycle MHD experiments with applied electric
and magnetic fields emphasizing current leakage,
segmentation, relaxation and aerodynamic effects
p0145 A69-23479

Experimental arrangement consisting of closed
cycle system, ionization duct and inductive MHD
converter with travelling wave component, using
H₂ as working medium
p0146 A69-23490

NERVA reactor technology applied to closed Brayton
cycle MHD power system
[AIAA PAPER 70-1225] p0170 A70-45956

NASA closed cycle MHD facility for power
generation, discussing system components, design
and operation
[AIAA PAPER 72-103] p0177 A72-16936

Evaluation testing of a closed Brayton-cycle
electrical-power-conversion system.
p0185 A73-25983

Single component closed loop, liquid potassium
magnetohydrodynamic generator
[NASA-CR-97883] p0209 N69-13045

Helicopter propulsion systems using closed cycle
working fluid
p0218 N69-23998

Performance of closed cycle MHD generators
[AD-747661] p0250 N73-12068

COAL

High efficiency coal oxidation solid electrolyte
fuel cell
[OCR-17] p0192 N68-12477

Hybrid fossil nuclear fueled MHD power cycle
characteristics
[BNL-125691] p0082 N69-11230

System and facility for generating electricity and
gas from lignite using high temperature nuclear
reactor
[JUL-554-AG] p0264 N69-13298

Splitting method of investigating strength
properties of typical rocks in coal and shale
deposits
p0083 N69-21442

Computerized simulation of optimal automatic
control of coal treatment plant
[AD-682791] p0084 N69-26099

Aerial infrared scanner to locate and detect
subsurface coal fires
p0086 N69-33683

Coal enrichment wastes suitable for extraction of
fuel gas
p0116 N70-10884

Cost estimates of oxygen blast enrichment of
lignite during gasification
p0117 N70-10885

Differential equations for calculating factors
causing spontaneous combustion in coal seams
p0090 N70-16595

Frictional pressure loss measurements in
horizontal pipelines for coal/water transport
p0092 N70-29067

Remote sensing for coal mined land reclamation
[NASA-CR-124608] p0097 N72-12329

Research projects in energy sources, energy
development, and exploitation
[ORNL-EIS-72-18-VOL-1] p0018 N72-25635

- Aerial photographic analysis of effects caused by coal combustion induced pollutants on Eastern white pine and vegetation p0101 N72-29363
- Production of fluid fuels and chemicals from coal [BN-IC-8551] p0101 N72-30123
- Hearing concerning new technologies for environmentally acceptable generation of electricity p0019 N72-30977
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry [E72-10064] p0102 N72-32336
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E72-10193] p0102 N73-10372
- Mapping ecological effects of coal strip mining in Ohio [E72-10256] p0102 N73-12356
- Environmental and ecological effects of coal strip mining in Ohio [E73-10003] p0019 N73-15339
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois [E73-10096] p0105 N73-18321
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois [E73-10371] p0105 N73-19366
- Ecological effects of coal strip mining in Ohio [E73-10430] p0106 N73-20391
- Feasibility of detecting subsurface coal fires in Wyoming and Montana from ground observation, aerial photography, and satellite imagery p0107 N73-22384
- Detection, monitoring, and mapping coal strip mining and reclamation in Ohio from ERTS-1 imagery [E73-10641] p0107 N73-25338
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E73-10776] p0108 N73-27252
- Identification and mapping of coal refuse banks in Pennsylvania anthracite coal fields from ERTS-1 data [PAPER-L24] p0110 N73-28319
- Application of ERTS-1 imagery to study of fracture-related safety hazards in Indiana coal mining industry [E73-10970] p0111 N73-30311
- Technologies for production and utilization of petroleum, natural gas, oil shale and coal [BN-IC-8612] p0111 N73-30335
- Application of ERTS-1 imagery to fracture-related mine safety hazards in Ohio coal mining industry [E73-11034] p0112 N73-31338
- Mapping of anthracite wastes from mining in Pennsylvania [E73-11107] p0112 N73-33264
- Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania [E73-11112] p0112 N73-33269
- COATINGS**
- Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties p0037 A72-24315
- Coated particle fuels for preventing undesirable reactions in nuclear reactors [ORNL-4324] p0083 N69-19605
- Development of surfaces and coatings for solar energy conversion systems [NASA-TT-P-14650] p0066 N73-15598
- COAXIAL FLOW**
- MHD generator with generator channel consisting of two coaxial cylinders with smooth annular space, discussing internal impedance sensitivity p0165 A70-24855
- Optimum geometric relationships in coaxial linear induction magnetohydrodynamic generator [AD-685523] p0221 N69-29843
- COAXIAL PLASMA ACCELERATORS**
- Coaxial plasma source energetic characteristics, establishing plasmod energy linear dependence on battery stored energy p0115 A72-26754
- COBALT**
- Electromechanical energy conversion devices using both conventional and rare-earth cobalt permanent magnet materials [AD-756433] p0252 N73-22168
- COBALT ISOTOPES**
- Cobalt oxide and cobalt oxide-magnesium oxide solutions for cobalt isotope power and heat source [DP-1192-1] p0086 N69-31541
- COBALT 60**
- Aerial detection of Co 60 fueled radioisotope thermoelectric generators [SC-TN-68-627] p0013 N69-19492
- CODING**
- ROD, nuclear and fuel-cycle analysis code, for circulating fuel reactors and optimizing core design [ORNL-TN-3359] p0098 N72-17737
- COILS**
- Superconductors in marine technology, including coils, solenoids, and magnetic systems [AD-755711] p0252 N73-22702
- COLD PLASMAS**
- Plasma dynamics experiments related to controlled nuclear fusion p0209 N69-13069
- COLOR PHOTOGRAPHY**
- Aerial 35mm color photography for reconnaissance uranium exploration and soil and rock identification in Wyoming Tertiary basins p0100 N72-26334
- COLORADO**
- Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [E73-10414] p0105 N73-20376
- Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum [E73-10700] p0108 N73-25392
- Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [PAPER-G30] p0109 N73-28261
- Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1 [EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367
- Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2 [EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368
- COMBUSTION**
- Combustion - Conference, University of Utah, Salt Lake City, August 1970 p0074 A71-38076
- Deficiencies in combustion technology, and 5 year research and development plan for air pollution control by combustion process modification [PB-198066] p0017 N71-31900
- COMBUSTION CHAMBERS**
- Temperature drop in combustion chamber of open cycle MHD power plant due to added potassium carbonate as function of various parameters p0140 A69-14162
- Self regenerating molten seed electrodes for open cycle MHD power generators longevity, regulating combustion chamber and gas flow seeding p0178 A72-18336
- Processes occurring in duct of open cycle magnetohydrodynamic generator [AD-683131] p0220 N69-27397
- Conversion of experimental turbojet combustor from ASTM A-1 fuel to natural gas fuel [NASA-TN-X-2241] p0094 N71-20533
- Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TN-D-6404] p0096 N71-31456
- Test facility for combustion flow in open cycle magnetohydrodynamic generator [AD-751251] p0251 N73-16036

SUBJECT INDEX

COMPUTER PROGRAMS

- Effect of fuel zoning and fuel nozzle design on exhaust pollution emissions at ground idle conditions for double-annular ram-induction combustor for turbofan engines
[NASA-CR-121094] p0104 N73-17916
- Combustion efficiency of annular turbojet combustor using heated natural gas as fuel
[NASA-TM-X-2742] p0105 N73-18960
- Design of high temperature combustor for use as solid fuel MHD generator and thermodynamic analysis of combustion conditions
[AD-764153] p0254 N73-31848
- COMBUSTION EFFICIENCY**
- Methane potentials as fuel for advanced aircraft, discussing performance, economy, combustion, heat transfer and handling
p0071 A69-33439
- Comparison of combustion characteristics of ASTM A-1, propane, and natural gas fuels in annular turbojet combustor
[NASA-TN-D-7135] p0104 N73-16771
- Combustion efficiency of annular turbojet combustor using heated natural gas as fuel
[NASA-TM-X-2742] p0105 N73-18960
- COMBUSTION PHYSICS**
- Development and characteristics of hydrogen-based mobile fuel systems and analysis of technical and economic problems in large scale application
[UCRL-51228] p0020 N73-16766
- COMBUSTION PRODUCTS**
- Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products
p0172 A71-22136
- Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality
p0075 A72-28879
- Combustion products thermodynamic parameters for natural gas burning in oxygen atmosphere, plotting gas temperature and flow rates against pressure and excess oxidant ratio
p0075 A72-29451
- Pollutants from methane fueled gas turbine combustion.
[ASME PAPER 72-WA/GT-3] p0075 A73-15867
- Combustion-driven magnetogasdynamic power generator designed to obtain direct current electric power generation data under thermal steady state conditions
p0202 N68-23346
- Effectiveness of enriching air with oxygen in installations with MHD generators
[SM-74/201] p0211 N69-13327
- Experimental investigation of MHD generator
[SM-74/206] p0211 N69-13331
- Composition and thermodynamic properties of combustion products of methane and air-oxygen
[SM-74/217] p0082 N69-13334
- Electrical conductivity of methane combustion products with aerosols
[AD-685511] p0222 N69-29923
- NASA technologies considered for application to sulfur dioxide problem of air pollution
[NASA-CR-100629] p0013 N69-39189
- Comparative emissions from leaded and prototype lead free automobile fuels
[BMRI-7390] p0092 N70-28685
- Deficiencies in combustion technology, and 5 year research and development plan for air pollution control by combustion process modification
[PB-198066] p0017 N71-31900
- MHD generator for measuring conductivity of hydrocarbon-oxygen combustion gases seeded with cesium salts
[AD-725739] p0245 N72-11065
- Analysis of major pollutants produced by aircraft engine exhaust and development of techniques to reduce level of pollutant emission
[NASA-TM-X-68129] p0102 N72-32754
- Effects of transportation combustion products in air pollution
[PB-213034] p0020 N73-20991
- COMBUSTION VIBRATION**
- Combustion oscillator for MHD energy conversion, using products flow modulation by traveling pressure wave
p0175 A71-38099
- COMMAND MODULES**
- Solar conversion power supply subsystem for Nimbus D satellite, and engineering tests
[NASA-CR-103418] p0055 N69-32305
- COMMERCIAL**
- Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392
- COMMERCIAL AIRCRAFT**
- Power generation for civilian aircraft in second century of powered flight
p0071 A68-43667
- Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality
p0075 A72-28879
- Fuel considerations for commercial supersonic transport aircraft
[AD-696588] p0117 N70-18542
- Conservation of fossil fuels in commercial aviation by using hydrogen
[NASA-CR-112204] p0102 N73-11019
- COMMUNICATION EQUIPMENT**
- Power sources for long economic life communication equipment
[AD-693847] p0227 N70-13293
- COMMUNICATION SATELLITES**
- Incore thermionic reactor as low cost power supply for direct-to-home TV satellite, converting thermal power to electrical without moving masses
p0173 A71-32853
- Hydrogen resistojets design and testing with Re heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer
[AIAA PAPER 72-449] p0115 A72-26186
- Hydrogen resistojets for primary propulsion of communications satellites.
p0009 A73-15741
- COMPARISON**
- Review and comparison of energy forecasts for United States of America
[PB-189938] p0015 N70-37343
- COMPATIBILITY**
- Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption
[SAE PAPER 710369] p0073 A71-24239
- Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427
- COMPOSITE MATERIALS**
- Optimal design of baseline configuration for solar array panel with deployable beam
[NASA-CR-130287] p0066 N73-15079
- COMPOSITE STRUCTURES**
- Stress and materials analysis of Fiberglass epoxy composite flywheels used for short term energy storage
p0261 A68-12853
- COMPRESSING**
- Thermodynamic cycle and optimum conditions of electric power source of MHD generator in combination with thermocompressor
p0142 A69-21592
- COMPRESSIVE STRENGTH**
- Splitting method of investigating strength properties of typical rocks in coal and shale deposits
p0083 N69-21442
- COMPRESSOR EFFICIENCY**
- Jet propulsion optimization by exergy and anergy for minimum total cost flux by varying unit compressor pressure ratio
p0008 A71-21300
- COMPUTER PROGRAMMING**
- Computer estimates of weight, cost, and reliability of six battery configurations
[NASA-CR-122296] p0266 N72-11982
- COMPUTER PROGRAMS**
- Conducting wall MHD generator channel current distribution, examining computer program for anode and cathode currents
p0169 A70-40013

- Quasi-vacuum mode thermionic converter for space and remote terrestrial power supplies, describing computer codes for design optimization p0172 A71-25899
- Computer program and mathematical model for calculating performance characteristics of solar thermoelectric energy conversion plate [NASA-CR-94615] p0049 N68-23987
- Computer program for analysis of space power systems [NASA-CR-73280] p0214 N69-14760
- Satellite power system configurations for maximum utilization of power [NASA-CR-100038] p0053 N69-18748
- Computer program developed to determine charged-particle irradiation effect on single solar cell power output [NASA-TN-X-63559] p0054 N69-27843
- Description and evaluation of digital computer program for analysis of Lundell alternators [NASA-TN-D-5814] p0233 N70-28433
- Examining fuel cycle codes using different techniques for fuel cost calculations [BNWL-SA-3605] p0094 N71-21050
- COMPUTERIZED DESIGN**
- Quasi-vacuum mode thermionic converter for space and remote terrestrial power supplies, describing computer codes for design optimization p0172 A71-25899
- COMPUTERIZED SIMULATION**
- Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection p0189 A73-38422
- Mathematical simulation of solution-gas drive performance of volatile oil reservoir using digital computer p0080 N68-21048
- Computerized simulation of optimal automatic control of coal treatment plant [AD-682791] p0084 N69-26099
- CONCENTRATORS**
- Optimal dimensions for high temperature cylindrical cavity solar energy receivers by studying concentrator and receiver operation p0023 A68-12549
- Computation and optimization of energy distribution over randomly oriented elements of radiation receiving surface of hollow collector of concentrator type solar device p0026 A69-22534
- Solar power concentrator-absorber system, discussing flux distribution in focal plane and cavity heater optimization p0027 A69-33795
- Performance of expandable whirling membrane solar energy concentrator for space power conversion [NASA-TN-X-59872] p0049 N68-27564
- Solar energy concentrator technology, design, and fabrication techniques [NASA-TN-X-59043] p0049 N68-27643
- Geometric properties of paraboloidal whirling membrane solar energy concentrators [NASA-TN-D-5859] p0058 N70-29807
- Concentrator device for controlling direction of solar energy onto energy converters [NASA-CASE-XLF-01716] p0059 N70-40234
- CONCENTRIC CYLINDERS**
- Magnetic induction concentric cylinder magnetohydrodynamic generator with cryogenic cooling [DLR-FB-70-25] p0240 N71-17840
- CONDUCTING FLUIDS**
- MHD generator induced magnetic field and end effects, considering electrically conducting fluid expansion in rectangular tube under external magnetic field p0126 A68-22803
- MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid p0176 A71-40020
- CONDUCTION BANDS**
- Electromagnetic processes in conduction band of traveling magnetic field of flat inductor in magnetohydrodynamic machines p0194 N68-16288
- CONDUCTIVE HEAT TRANSFER**
- Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control [AIAA PAPER 68-122] p0120 A68-17540
- Transient solidification outside cooled pipe with application to solar Brayton heat receiver [NASA-TN-D-4897] p0052 N69-10227
- CONDUCTIVITY**
- MHD generator for measuring conductivity of hydrocarbon-oxygen combustion gases seeded with cesium salts [AD-725739] p0245 N72-11065
- CONDUCTORS**
- Ponderomotive forces acting upon conductive bodies in traveling magnetic field of cylindrical inductor, and effect on magnetohydrodynamic generator design p0195 N68-16292
- CONFERENCES**
- Energy conversion - Conference, Boulder, August 1968 p0134 A68-42507
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 1, Closed cycle MHD with gaseous working fluids p0001 A69-23433
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 2, Closed cycle MHD with gaseous working fluid p0003 A69-23464
- Power sources - U.S. Army Conference, Atlantic City, May 1968 p0262 A69-23990
- Astronautics - Conference, Braunschweig, West Germany, October 1968, Volume 2, Energy sources p0147 A69-25862
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 5, Open-cycle MHD p0004 A69-27468
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 3, Closed cycle MHD with liquid-metal working fluids p0004 A69-27474
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 4, Open cycle MHD p0006 A69-28021
- Thermionic electrical power generation - Conference, Stresa, Italy, May 1968 p0152 A69-29172
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 6 p0006 A69-29477
- Energy conversion - Conference, Washington, D.C., September 1969 p0158 A69-42236
- Magnetohydrodynamics - JPL Conference, Pasadena, March 1970 p0168 A70-40001
- Power sources - Conference, Atlantic City, May 1970 p0007 A71-13026
- Petroleum mechanical engineering and pressure vessels and piping - ASME Conference, Denver, September 1970 p0262 A71-14767
- Combustion - Conference, University of Utah, Salt Lake City, August 1970 p0074 A71-38076
- Energy conversion engineering - Conference, Boston, August 1971 p0175 A71-38901
- MHD - Conference, Argonne, Illinois, March 1972 p0179 A72-29351
- Electrocatalysis and fuel cells - Conference, Seattle, December 1970 p0180 A72-33876
- Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. p0182 A73-11826
- Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. p0040 A73-14203
- Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings. p0183 A73-22751
- Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volumes 1 & 2. p0185 A73-25976

SUBJECT INDEX

CONTINENTAL SHELVES

- Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. p0187 A73-29581
- Engineering aspects of magnetohydrodynamics: Proceedings of the Thirteenth Symposium, Stanford University, Stanford, Calif., March 26-28, 1973. p0188 A73-38310
- Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum. p0188 A73-38386
- Pollution free hybrid fossil nuclear fueled magnetohydrodynamic power cycle [BNL-123191] p0202 N68-26381
- Conference proceedings on performance predictions and technological developments for static energy conversion devices for space missions [AGARD-CP-211] p0203 N68-28714
- Research studies in plasma physics, thermonuclear reactions, and magnetohydrodynamic generators [AFOSR-68-1377] p0206 N68-31928
- Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics [AD-674611] p0012 N69-13314
- Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry [CONF-680610] p0087 N69-37355
- Space power systems lectures on sources and requirements [ESRO-SP-451] p0226 N70-11301
- Cost estimates for nuclear energy and heat use in various industrial plant processes p0013 N70-14504
- Abstracts for symposium on uranium plasma research [NASA-CR-107857] p0229 N70-17651
- Fuel cells and storage batteries for different types of energy conversion [AD-696428] p0230 N70-21253
- Conference on fuel cells and batteries [AD-718833] p0016 N71-23353
- Design and development of auxiliary power unit and air breathing propulsion system for space shuttle vehicle p0095 N71-29603
- Uranium plasmas applied to nuclear rocket engines, MHD generators, nuclear lasers, and plasma stability and flow - conference [NASA-SP-2361] p0242 N71-33626
- Proceedings of conference on licensing and control of nuclear power plants [IAEA-SM-146/51] p0017 N71-35176
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-2821] p0018 N72-13391
- Proceedings of conference on magnetohydrodynamic electrical power generation [AD-736450] p0247 N72-15235
- Interrelationships between energy, resources, and environment, conference summary [PB-213031] p0020 N73-20820
- Conference on use of solar energy in Mediterranean [BULL-221] p0069 N73-33762
- CONFIDENCE LIMITS**
- Social quantitative benefit vs risk assessment of new technologies, considering atomic power safety p0007 A71-21220
- CONGRESS**
- Congressional hearings on air pollution control research in motor vehicle, aircraft, and diesel exhausts, and industrial and federal facilities wastes p0015 N70-36154
- Senate subcommittee hearings on air and water pollution, including data on noise pollution and automobile fuel research p0016 N70-41770
- Senate subcommittee hearings on air and water pollution, including data on air quality standards and gasoline additive developments p0016 N70-41771
- Factors relevant to development of fuels and energy policies compatible with environmental control p0016 N71-29471
- Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast p0096 N71-35178
- Analysis of Usenergy resources and review of national laws and policies which influence energy situation p0096 N71-35181
- Indexes for inventory of energy research p0018 N72-25931
- Hearing concerning new technologies for environmentally acceptable generation of electricity p0019 N72-30977
- Hearings concerning research and development requirements for future energy needs p0019 N73-10980
- Congressional hearings on earthbound potential utilization of solar energy p0066 N73-14812
- Congressional hearings on research and development of environmentally safe electric power production p0020 N73-20976
- Congressional study on historical background of energy research and development p0021 N73-22928
- Hearings concerning energy problems of US p0021 N73-23969
- Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity p0022 N73-33928
- CONICAL BODIES**
- Calorimetric efficiency of cone and column solar energy concentrator [NASA-TN-D-5109] p0053 N69-21088
- CONNECTORS**
- Expanding and contracting connector strip for solar cell array of Nimbus satellite [NASA-CASE-XGS-01395] p0053 N69-21539
- CONSERVATION**
- Conservation of fossil fuels in commercial aviation by using hydrogen [NASA-CR-112204] p0102 N73-11019
- CONSERVATION LAWS**
- Liquid metal MHD conservation cycles, discussing evolution and status of power generation at various temperatures p0167 A70-39325
- CONTACT RESISTANCE**
- Thermoelectric power generators energy output efficiency, discussing thermal and electric contact resistances influence for optimizing parameters p0147 A69-26364
- CONTAMINANTS**
- Pollutants from methane fueled gas turbine combustion. [ASME PAPER 72-WA/GT-3] p0075 A73-15867
- Contaminant determination in oil by neutron activation analysis p0089 N70-15280
- CONTINENTAL SHELVES**
- Outer continental shelf lands of United States - Vol. 1, international considerations and federal jurisdiction [PB-188714] p0014 N70-25747
- Outer continental shelf lands of United States - Vol. 2, legal and resource aspects [PB-188715] p0014 N70-25748
- Outer continental shelf lands of United States - Vol. 3, resource aspects, user interaction and environmental impact, analyses [PB-188716] p0014 N70-25749
- Outer continental shelf lands of United States - Vol. 4, appendices on legal matters [PB-188717] p0015 N70-25750
- Outer continental shelf lands of United States - Vol. 5, appendices including bibliography, questionnaire to industry, oil and gas lease notices, and comparative laws and policies [PB-188718] p0015 N70-25751

CONTROL EQUIPMENT

SUBJECT INDEX

Outer continental shelf lands of United States - Vol. 6, appendices including offshore mineral leasing acts, foreign laws and policies, and compilation of alternatives [PB-188719] p0015 N70-25752

Applicability of NASA contract quality management and failure mode effect analysis procedures to USGS Outer Continental Shelf oil and gas lease management program [NASA-TN-X-2567] p0100 N72-25955

Geophysical survey of continental shelves off African coast and mapping for oil potential [PB-211393] p0103 N73-14400

CONTROL EQUIPMENT

Book on electromechanical energy conversion devices covering voltage generation, torque production, components of control systems, dynamics and direct energy conversion p0131 A68-31864

Design of ESRO 1, ESRO 2, and HEOS A power systems and control equipment [ESRO-TN-83] p0057 N70-17621

Power and load priority control concept for Brayton cycle power system providing speed control and field current control for alternator and load simulation which includes energy storage [NASA-TN-D-6478] p0244 N71-36452

CONTROL RODS

Rod heater with indirect resistance heating for simulation of nuclear fuel rods [KFK-894] p0230 N70-22247

CONTROLLABILITY

Hydrazine-air fuel cell controls [AD-684339] p0221 N69-28781

CONTROLLED FUSION

Controlled nuclear fusion diagnostics, plasma stability and minimum magnetic field configuration p0123 A68-20598

Power production based on controlled fusion of deuterium and tritium nuclei, noting use of magnetic bottle for plasma confinement p0131 A68-32685

High temperature plasmas and attempts to achieve controlled thermonuclear fusion, discussing plasma properties p0132 A68-38740

Plasma generation and heating by controlled thermonuclear fusion reactions using pulsed lasers p0164 A70-22249

Fusion energy technology, discussing controlled reactor construction and operation p0171 A71-20000

Pulsed power - A new technology for controlled thermonuclear fusion. p0181 A72-36332

Pulsed laser produced high temperature plasma for electric power generation by controlled nuclear fusion, discussing gas dynamic model p0181 A72-43723

Engineering problems in the design of controlled thermonuclear reactors. [AIAA PAPER 73-259] p0182 A73-16980

Review of controlled fusion research using laser heating. [AIAA PAPER 73-258] p0183 A73-17667

Laser energy absorption by plasma for controlled thermonuclear fusion, comparing uses of electrically pumped gas, chemical and solid state lasers p0187 A73-35379

Economic generation of power from thermonuclear fusion [CLM-R-85] p0202 N68-25016

Current and proposed experiments on magnetic mirror confinement of fusion plasmas [TID-24254] p0203 N68-29063

Numerical calculation methods for various plasma physics and controlled fusion problems [UCRL-71205] p0207 N68-35919

Plasma dynamics experiments related to controlled nuclear fusion p0209 N69-13069

Superconducting magnet of niobium-titanium and copper composite for use in controlled thermonuclear fusion research [UCRL-71010] p0218 N69-22640

Electron screening effects on thermonuclear reactions under high densities [ITF-69-7] p0223 N69-34199

Controlled thermonuclear fusion for space power and propulsion p0229 N70-18729

Estimation of power requirement of plasma heating in self-sustaining toroidal fusion devices [MATT-803] p0246 N72-11641

Bibliography on controlled fusion and plasma physics [TID-3557-1971-SUPPL] p0250 N73-12785

CONVERSION

Compilation of references on direct conversion of heat into electrical energy [BLG-427] p0223 N69-32934

CONVERTERS

Three phase DC-AC inverter with low harmonic distortion, good efficiency and packaging capability, stabilizing frequency by crystal controlled clock oscillator p0162 A69-42294

COOLERS

Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion p0138 A68-42954

COOLING

Magnetic induction concentric cylinder magnetohydrodynamic generator with cryogenic cooling [DLR-FB-70-25] p0240 N71-17840

COOLING SYSTEMS

Materials and cooling of aircraft gas turbine engines noting nickel and tantalum alloys, turbine inlet temperatures, coatings, etc p0122 A68-19791

Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0072 A68-44975

Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks [AIAA PAPER 68-997] p0072 A68-45023

Packed bed catalytic reactors cooling capacity in promoting endothermic reactions of hydrocarbon fuels, using computerized temperature and composition profiles [AIAA PAPER 69-588] p0072 A69-33265

Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0115 A69-43725

Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials [ICAS PAPER 70-16] p0115 A70-44127

Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks [AIAA PAPER 68-997] p0073 A71-24852

Paramagnetic cycles for low temperature superconducting magnet cooling, discussing refrigerator, cryogenic pumps, regenerators and adjustable heat source and sink p0176 A71-40898

Cooling system based on vaporization of solar cell preheated solution drawn through chamber with atomizing injector p0037 A72-24314

Test apparatus and technique for assessing Peltier thermoelectric cooling device operational characteristics p0178 A72-27721

Thermosiphon evaporation-condensation-evaporation cycle cooling system operation and effectiveness in thermoelectric cooling and generator devices p0187 A73-30950

Operation, research, and maintenance of gas coolant loops of Pegase nuclear fuel testing reactor [CEA-R-3564] p0221 N69-27494

Uranium fueled fast steam cooled reactors in SNEAK series [EUFNR-608] p0085 N69-31161

Cooling systems for fast reactor cores [EURFNR-615] p0086 N69-31655

SUBJECT INDEX

COST ESTIMATES

- Methane or hydrogen fuel direct cooling of first stage stator of SST aircraft turbine - numerical heat transfer analysis [NASA-TN-D-6042] p0117 N70-42326
- Hydrocarbon fuels and fuel systems that meet cooling and propulsion requirements of advanced air breathing engines [AD-737372] p0100 N72-23806
- COPPER ALLOYS**
- Superconducting magnet of niobium-titanium and copper composite for use in controlled thermonuclear fusion research [UCRL-71010] p0218 N69-22640
- COPPER SULFIDES**
- CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption p0034 A71-11896
- Thin film Cu-CdS solar cell electrochemical plating potential and solution composition effects on copper sulfide surface layer formation and cell efficiency p0038 A72-28008
- Improved efficiency of cadmium sulfide-copper sulfide thin film solar cells, noting optimization of layer formation, gridding and encapsulation p0038 A72-28016
- High efficiency Cu₂S-CdS-solar cells with improved thermal stability. p0041 A73-14216
- Investigations of the inhomogeneity of polycrystalline Cu₂S/CdS solar cells. p0041 A73-14222
- CORROSION PREVENTION**
- Characteristics of protective effect of petroleum soluble corrosion inhibitors for iron in electrolyte hydrocarbon two-phase system [AD-694781] p0258 N70-14391
- CORROSION RESISTANCE**
- Solar cells with improved photoelectric efficiency, describing use of noncorroding Ti-Pd-Ag contacts, titanium oxide antireflection layer and welded cell joints p0037 A72-17751
- COST ANALYSIS**
- Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides fabrication, costs, etc p0028 A69-35708
- Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology p0036 A71-31671
- Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies p0038 A72-28034
- Solar array cost reduction. p0039 A72-37642
- Commercial space applications economics, discussing meteorological, navigational traffic control and communications satellites, nuclear waste disposal, space manufacturing, solar power generation, etc p0009 A72-45216
- Superconducting magnet ac generators development, emphasizing conversion efficiency, manufacturing, relative costs, machine geometry and interwinding coupling factor effects p0182 A73-11833
- Electrical and isotope power from space for terrestrial use. p0042 A73-18028
- The utilization of solar energy to help meet our nation's energy needs. p0045 A73-32193
- Electrolytic hydrogen fuel production with solid polymer electrolyte technology. p0116 A73-38413
- Hydrazine and methanol fuel cells comparison with hydrogen-air cells in terms of fuel costs and conversion efficiency, considering electric generators and automotive applications p0116 A73-45025
- Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs p0087 N69-35240
- Cost analyses for thermal-hydraulic, physics, and fuel-cycle economics of pressurized water reactors using annular metal pins as fuel [ORNL-TM-2493] p0088 N70-12423
- Cost analysis for geothermal boiler installation for mining thermal heat sources p0090 N70-16590
- Cost analysis for reprocessing of irradiated plutonium and uranium mixed oxides [CEA-CONF-1534] p0093 N70-39139
- Examining fuel cycle codes using different techniques for fuel cost calculations [BNWL-SA-3605] p0094 N71-21050
- Cost analysis of large scale solar cell power for terrestrial applications [NASA-TM-X-2520] p0063 N72-19057
- Cost analysis and design of possible fusion reactor coil systems [UCRL-73187] p0019 N73-12741
- Design and fabrication of wraparound silicon solar cells [NASA-CR-121003] p0067 N73-20044
- COST EFFECTIVENESS**
- Cost efficiency and relative economic merits prediction for solar energy conversion systems p0037 A72-24316
- Cost goals for silicon solar arrays for large scale terrestrial applications. p0041 A73-14250
- Hypersonic transports - Economics and environmental effects. p0009 A73-34435
- Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources. p0188 A73-38389
- The availability and cost of curium-244 from power reactor fuel reprocessing wastes. p0077 A73-38430
- Analysis of solar cell array systems for cost effectiveness in production and design [NASA-CR-109527] p0057 N70-25500
- Cost effectiveness of solar cell space power systems [NASA-TM-X-68054] p0063 N72-25022
- Feasibility of thermal energy storage and solar heating as means of conservation and more efficient utilization of electric power [PB-210359] p0065 N73-10976
- Interrelationships between energy, resources, and environment, conference summary [PB-213031] p0020 N73-20820
- Economic benefits of electrochemical fuel cells [NASA-TT-F-15147] p0254 N73-31991
- COST ESTIMATES**
- Potential in performance improvements in air breathing propulsion related to reliability, maintainability and cost p0131 A68-33438
- Cost analysis of liquid hydrogen for aircraft fuel, considering production methods, plant capacity and technological advances p0001 A68-33457
- Technological evolution of solar generators for terrestrial applications and sounding balloons, discussing environment caused problems and solutions, energy cost estimate and future prospects p0042 A73-14253
- Power plants, cost estimates, freighter missions, commercial feasibility and technology for nuclear air cushion vehicles p0187 A73-32194
- Curium 244 heat source design for multihundred watt radioisotope thermoelectric generator with Si-Ga thermocouples for energy conversion, noting low cost p0077 A73-38429
- Equilibrium fuel cycle costs for low-enriched, unclad, helium cooled, uranium oxide graphite reactor [ORNL-TM-1789] p0078 N68-12420
- Cost estimates for preparation and fabrication of solid-gel metal-clad uranium and plutonium oxide fuel elements [ORNL-TM-1779] p0078 N68-12553
- Fuel cost program for use of plutonium in thermal reactors [EUR-3890.I] p0081 N68-23663

COST REDUCTION

SUBJECT INDEX

- Increased thermal efficiency and increased Diesel engine size economics
[REPT.-1] p0081 N68-24990
- Study, cost, and systems analysis of present and projected liquid hydrogen production
[NASA-CR-73226] p0011 N68-28227
- Review and screening of defense and space oriented technology applicable to urban transportation problems
[PB-178272] p0011 N68-31690
- Phoenix nuclear fuel cycle costs evaluated for use in maritime reactor design
[BNWL-851] p0082 N69-15543
- Costs and flow charts for thorium and uranium recovery from HTR fuel elements containing silicon carbide coated fissile and fertile particles
[GAND-8661] p0083 N69-17117
- Cost of thorium fuel cycles for heavy water and graphite moderated reactors
[EUR-4264.E] p0085 N69-31081
- Utility needs and reliability of operational fast breeder reactors
p0087 N69-35243
- Cost estimates of oxygen blast enrichment of lignite during gasification
p0117 N70-10885
- Cost estimates for nuclear energy and heat use in various industrial plant processes
p0013 N70-14504
- Cost estimates for manufacturing hydrogen and oxygen in water electrolysis and fossil fuel plants
p0117 N70-14511
- Investigating relationship of conversion efficiency to fixed and variable costs in fusion reactors
[UCRL-72349] p0239 N71-15242
- Computer estimates of weight, cost, and reliability of six battery configurations
[NASA-CR-122296] p0266 N72-11982
- Uranium market affecting prices and nuclear power plant use
[NP-19069] p0099 N72-20603
- Design of low cost terrestrial photovoltaic power system using solar array
[NASA-CR-127031] p0064 N72-26034
- Design and cost estimate of high altitude wind power plant
[NASA-TT-F-14903] p0107 N73-23011
- Production cost optimization for thermoelectric solar cell
[AD-759812] p0068 N73-25104
- COST REDUCTION**
- Silicon solar cell specifications and cost reduction without output or reliability loss
p0033 A70-41008
- Hydrazine-oxygen fuel cells energy costs minimization by optimizing diaphragm thickness, hydrazine concentration and load
p0171 A71-14321
- Jet propulsion optimization by exergy and energy for minimum total cost flux by varying unit compressor pressure ratio
p0008 A71-21300
- Solar array cost reduction.
p0039 A72-37642
- Solar cell optical properties effects on electrical and thermal performance and cost savings in panel design optimization
p0041 A73-14226
- Economic analysis of silicon solar cells production noting cost reduction from feasibility studies of edge defined film fed crystal growth in ribbon form
p0041 A73-14251
- Solar array cost reductions.
p0044 A73-29592
- Technological improvements for reducing costs of solar cells and solar arrays
[NASA-TM-X-68035] p0063 N72-21033
- COSTS**
- Fuel cycle cost comparisons for low enriched uranium
[ORNL-TM-2173] p0083 N69-17558
- Determining economic effectiveness of optimum nonregenerative gas turbines
[AD-683130] p0013 N69-26227
- Cost analysis and engineering processes for civilian nuclear power production
p0087 N69-37567
- Basic and applied research in seismology, research and training facilities, users, and funding
[NASA-CR-107020] p0087 N70-12263
- Fuel depletion and sodium void coefficients, and economic evaluation of sodium cooled fast nuclear reactor
p0230 N70-22218
- Loss rate and capital costs of storing energy in superconducting coils
[DLR-FB-72-10] p0267 N72-26656
- COUNTERMEASURES**
- Degradation, dispersion and movement of oil slicks by wind and ocean as factors influencing applicability of countermeasures
[WHO-359] p0112 N73-32300
- COUPLING**
- Coupling with liquid metal flywheel rotating under action of crossed electric and magnetic fields
p0123 A68-20399
- COUPLING CIRCUITS**
- Optimal power conversion from solar array to spacecraft battery, obtaining power coupling by using high efficiency switching techniques
p0023 A68-17380
- STAR /Stud and Rocker Panel/ four couple section improved by incorporating bonded tungsten electrical contacts for PbTe thermoelectric elements
p0162 A69-42261
- COVERINGS**
- Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides fabrication, costs, etc
p0028 A69-35708
- CRITICAL LOADING**
- MHD generators optimum load selection by method of stepwise approach, noting agreement with pressure and density distributions to yield maximum power
p0164 A70-24156
- CRITICAL TEMPERATURE**
- Criticality calculations for plutonium oxide radioisotope heat source
[MLN-1532] p0082 N69-15081
- Critical fuel loading, core hot-spot power generation, and detailed fission rate measurement of critical or subcritical reactors
p0088 N70-14123
- CROPS**
- Monitoring and evaluation of water quality, ice cover on Great Lakes, spread of crop viruses, and damage to strip mining areas
p0101 N72-29317
- CROSSED FIELD AMPLIFIERS**
- High efficiency and power long life cross field amplifier generator for solar energy conversion in space into microwave, discussing magnetron and amplatron
p0035 A71-28668
- CROSSED FIELDS**
- Coupling with liquid metal flywheel rotating under action of crossed electric and magnetic fields
p0123 A68-20399
- One dimensional plasma flow variables relations analyzed in crossed electric and magnetic fields with small magnetic Reynolds numbers
p0126 A68-23796
- Instabilities in F seeded Ar plasma in crossed electric and magnetic fields and with nonequilibrium ionization, noting effects on MHD generator characteristics
p0143 A69-23457
- Mercury cesium plasma in crossed electric and magnetic fields as working fluid of MHD generators based on Rankine cycle
p0143 A69-23458
- Direct conversion of thermal energy into electrical energy using crossed electric and magnetic fields
[NASA-CASE-XLE-00212] p0235 N70-34134
- Crossed field MHD plasma generator-accelerator
[NASA-CASE-XLA-03374] p0239 N71-15562

CRUDE OIL

- Gemini space photography applications in petroleum industry, especially for geologists involved in regional mapping or modern environmental research
p0071 A68-30437
- Aromatic hydrocarbon influence on lubricity of petroleum oils, noting mixtures with paraffins, low loads scuffing and decomposition
p0071 A68-41768
- Petroleum sulfides advantageous effect on oxygen consumption during combustion
p0072 A69-19456
- Viscosity-temperature chart for hydrocarbons permitting linear extrapolations into low viscosity high temperature regions
p0072 A69-23975
- Petroleum mechanical engineering and pressure vessels and piping - ASME Conference, Denver, September 1970
p0262 A71-14767
- The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.
p0076 A73-25465
- Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- Aircraft design for transporting arctic crude oil or liquid natural gas, examining air terminal requirements and handling specifications
p0077 A73-41172
- Gravimetric surveys of Monzhukly structure in relation to oil and gas deposits
[ACIC-TC-1217] p0078 N68-19240
- Generation of hydrocarbons from straight chain fatty acid, formation of long chain n-alkanes, and origin of crude oil
p0078 N68-10418
- Test evaluation of monoisopropyl diphenyl, and gas oil as organic reactor moderators
[PTD-HT-66-746] p0079 N68-12884
- Hydration method for determination of sulfur in petroleum
[NSTIC-13106/67] p0079 N68-15630
- Constant pressure apparatus for measuring oxygen absorption of petroleum hydrocarbons at high temperatures
[TG-230-T533] p0079 N68-15844
- Survey on organic geochemistry origins and use of gas-liquid chromatography and mass spectrometry analyses of organic components isolated from crude oils and sediments
[NASA-CR-93111] p0079 N68-17316
- Exploratory geology and use of seismology in petroleum industry
p0079 N68-17606
- Seismic wave propagation used in prospecting for oil fields and minerals
p0080 N68-17607
- Mathematical simulation of solution-gas drive performance of volatile oil reservoir using digital computer
p0080 N68-21048
- Technical reference manual for protective interior liners of petroleum fuel containers
[AD-666969] p0263 N68-23614
- Satellite-aircraft approach to oil detection and rock identification in North and South America
[NASA-CR-101384] p0084 N69-28160
- Literature survey on properties of microbiological synthesis of protein substances from petroleum hydrocarbons
[JPRS-48150] p0084 N69-29789
- Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology
[SM-112/24] p0084 N69-30799
- Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets
[SN-112/25] p0085 N69-30800
- Natural isotopic distribution studies for evaluation of new hydrocarbon deposits
[SN-112/27] p0085 N69-30801
- Oil slick spreading on calm sea due to force of gravity and surface tension of water
p0257 N70-10537
- Characteristics of protective effect of petroleum soluble corrosion inhibitors for iron in electrolyte hydrocarbon two-phase system
[AD-694781] p0258 N70-14391
- Trace element characterization in oil polluted water by neutron activation analysis
p0088 N70-15236
- Contaminant determination in oil by neutron activation analysis
p0089 N70-15280
- Investigating petroleum products for capacity to absorb sulfur dioxide from industrial waste gases
[NRL-RTS-5464] p0091 N70-20779
- Petroleum products handbook - spark ignition piston, air breathing, jet, and diesel engine fuel systems
[AD-698440] p0092 N70-23046
- Petroleum products handbook - fuel additives, antiknock, storage, corrosion, motor oils, and boiler fuels
[AD-698546] p0092 N70-23047
- Petroleum products handbook - drive-train oils, lubricating oils for aircraft gas turbine engines, industrial and insulating oils
[AD-698547] p0092 N70-23048
- Petroleum products handbook - oil additives, viscosity, antioxidants, anticorrosion, detergents, antifoams, and lubricants
[AD-698548] p0092 N70-23049
- Seven kilometer oil drilling rig
p0092 N70-24796
- Ultrasonic energy effects on flow rate of crude oil through porous sandstone
p0092 N70-25326
- Soviet Bloc research on petroleum refining and additive properties
[AD-700689] p0093 N70-35477
- Remote sensing of oil slicks by radar
[AD-709982] p0258 N70-42226
- Decontamination of petroleum products with honey
[NASA-CASE-XNP-03835] p0095 N71-23499
- Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases
[PB-198775] p0017 N71-32624
- Legal, economic, and technical aspects of liability and financial responsibility of oil pollution
[PB-198776] p0017 N71-32625
- Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000
[NLL-TRANS-1166-(9022.9)] p0096 N71-35501
- Analysis of rate of oxidation of petroleum products in water under conditions where nitrogen, phosphorous, and potassium are present
[NLL-NSTIC-TRANS-2474-(6180.59)] p0097 N71-37701
- Detection and monitoring of oil slicks on sea surface using four frequency radar system
p0097 N72-12311
- Research projects in energy sources, energy development, and exploitation
[ORNL-EIS-72-18-VOL-1] p0018 N72-25635
- Reliability analysis on petroleum industry requirements
p0100 N72-25986
- Future aircraft fuel resource availability and pricing, processing methods, and economic projections for period 1970 to 2000
[NASA-TN-X-62180] p0102 N72-32742
- Set of variables crucial to economic outcome of petroleum exploration
[NASA-CR-129595] p0103 N73-13991
- Two stochastic models for petroleum exploration
[NASA-CR-129611] p0103 N73-13992
- Air-cushion tankers for transporting Alaskan North Slope oil
[NASA-TN-X-2683] p0258 N73-18981
- Commercial utility of ERTS-1 imagery in structural reconnaissance of Precambrian Shield for minerals and petroleum
[E73-10523] p0107 N73-23414
- Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392

CRYOGENIC FLUID STORAGE

SUBJECT INDEX

Analysis of ERTS-1 imagery of Northern Coast Ranges and Sacramento Valley, California for locating mercury deposits and oil and gas fields [PAPER-618] p0109 N73-28249

Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [PAPER-630] p0109 N73-28261

Technologies for production and utilization of petroleum, natural gas, oil shale and coal [BM-IC-8612] p0111 N73-30335

Problems and prospects for marine transportation of oil [NASA-CR-133854] p0258 N73-30464

CRYOGENIC FLUID STORAGE

Electric power generation and cryogenic gas storage systems for Apollo applications program mission planning [NASA-TN-X-61072] p0048 N68-23182

CRYOGENIC FLUIDS

Application and characteristics of cryogenic fuels for air breathing gas turbine engines p0118 N71-19463

Theoretical and parametric study of inductive magnetohydrodynamic converters including design of cryogenic experimental 4 kW converter [DLR-FB-71-74] p0251 N73-15757

CRYOGENIC MAGNETS

Large superconducting magnets for MHD power plants, discussing scale-up requirements, cryogenic system, stable operation margin and emergency system shutdown p0122 A68-20175

Inductive magnetic energy storage with superconductors or cryogenic aluminum conductors [LA-DC-12990] p0267 N72-17829

CRYOGENICS

Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications. [ASME PAPER 72-AERO-12] p0181 A72-43148

The Solar Collector Thermal Power System - Its potential and development status. p0043 A73-22792

Theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics [UAPL-31] p0207 N68-37342

Magnetic induction concentric cylinder magnetohydrodynamic generator with cryogenic cooling [DLR-FB-70-25] p0240 N71-17840

CRYOPUMPING

Paramagnetic cycles for low temperature superconducting magnet cooling, discussing refrigerator, cryogenic pumps, regenerators and adjustable heat source and sink p0176 A71-40898

CRYSTAL GROWTH

Economic analysis of silicon solar cells production noting cost reduction from feasibility studies of edge defined film fed crystal growth in ribbon form p0041 A73-14251

CUBIC LATTICES

Cubic stabilized zirconia utilization as solid electrolyte in high temperature fuel cell system for efficient and economical energy conversion p0263 A72-33894

CURIUM 244

Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources. p0188 A73-38389

Curium 244 heat source design for multihundred watt radioisotope thermoelectric generator with Si-Ge thermocouples for energy conversion, noting low cost p0077 A73-38429

The availability and cost of curium-244 from power reactor fuel reprocessing wastes. p0077 A73-38430

Use of Cm-244 as radioisotope power fuel in electric power conversion systems [CONF-720519-1] p0103 N73-12717

CURRENT DENSITY

Two dimensional analysis of end region of single load crossconnected MHD generator, noting grading resistors use to remove infinite concentrations p0128 A68-25596

Current density distribution in simulated argon-potassium MHD generator p0129 A68-27085

Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model p0130 A68-29186

Fuel cells power density improvement under pulsed loading at high current density and constant voltage p0166 A70-27758

Optimization of constant current electromagnet in MHD generator [SM-74/83] p0210 N69-13317

Emission characteristics of refractories and magnetic field influence on current distribution along electrodes - MHD generators [SM-74/92] p0210 N69-13319

Experimental results of 100 kW MHD generator [SM-74/212] p0210 N69-13325

Hall effect in MHD channels with segmented electrodes [SM-74/248] p0213 N69-13352

CURRENT DISTRIBUTION

Nonuniform current distribution effect on segmented electrode Hall MHD generators and accelerators p0126 A68-23914

Current density distribution in simulated argon-potassium MHD generator p0129 A68-27085

O shaped magnetic systems using unsaturated steel magnetic circuit to produce strong uniform magnetic fields for MHD machines p0143 A69-23102

Current and voltage distribution around normal shock in MHD duct using conformal transformation, considering continuous and segmented electrode boundary conditions p0146 A69-25359

Faraday type MHD energy converters in nonequilibrium conduction mode, analyzing two dimensional current and potential distributions in plane normal to magnetic field p0146 A69-25397

MHD energy converters electric fields and current distributions, analyzing MHD flow problems p0157 A69-39480

Conducting wall MHD generator channel current distribution, examining computer program for anode and cathode currents p0169 A70-40013

Transverse current leakage effect on energy conversion and Hall characteristics of MHD generator p0171 A71-12195

Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakages and current distribution p0179 A72-29353

Current distribution in magnetohydrodynamic generators with two pair of finite length electrodes separated by isolated sections p0192 N68-11664

Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics [AFOSR-68-0859] p0202 N68-26537

Rotating disks, current and potential distribution in cylindrical geometries, foaming electrolyte fuel cell, and iodine cathode p0223 N69-34813

Measurements of potential and current density distributions in simulated Faraday-type MHD generator working with argon-potassium plasma [IPP-3/104] p0234 N70-31285

Current distribution of segmented Hall generator [AD-705160] p0234 N70-32778

CURRENT REGULATORS

Satellite power supply control systems analysis of solar cell array battery
[ESRO-TM-54/ESTEC/] p0047 N68-18466

CURVED PANELS

Space erectable rollup solar array of arcuate solar panels furled on tapered drum for spacecraft storage during launch
[NASA-CASE-NPO-10188] p0061 N71-20273

CYCLES

Computerized calculation of gas turbine cycles thermal efficiency, using hydrocarbon fuel, considering fuel composition and heat of combustion changes
p0073 A70-43439

Fast breeder reactor design considerations of blanket cycle efficiency and management
p0086 N69-31987

CYLINDRICAL CHAMBERS

Linear inductive MHD converters, reducing effects of losses due to finite length of converter by cylindrical construction
p0150 A69-27505

CYLINDRICAL SHELLS

Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799

D

DATA ACQUISITION

Commercial aviation gasoline inspection data tabulated and compared for 1969 and 1968
[SA2 PAPER 790228] p0073 A70-25897

DC 8 AIRCRAFT

Economics of using gelled fuels in commercial jet transport
[FAA-NA-70-45] p0093 N70-34002

DECAY RATES

Usefulness of decay rate in radioactive waste stock management
[CEA-R-3731] p0087 N69-38022

DECISION THEORY

Bayesian decision theory, discussing choice of possible systems to convert wind into electrical energy
p0074 A71-33291

DECONTAMINATION

Decontamination of petroleum products with honey
[NASA-CASE-XNP-03835] p0095 N71-23499

DEFENSE PROGRAM

Energy requirements of Department of Defense and identification of research and development activities
[AD-754824] p0106 N73-20819

DEGRADATION

Cds thin film solar cells, describing manufacture for increased degradation resistance
p0033 A70-43537

DELAWARE

Pollution hazards from petroleum industries and shipping in Delaware Bay
p0104 N73-16948

DEMAND (ECONOMICS)

Signed digraphs for forecasting energy demands and analyzing policies for meeting environmental constraints on energy use
[R-756-MSF] p0018 N72-20948

DEMINERALIZING

Minerally entrapped fatty acids analyzed after demineralization liberation of exhaustively extracted oil shale from Green River Formation
p0071 A68-27231

DENMARK

Plasma generators and plasma research in Denmark
p0216 N69-18448

DENSITY DISTRIBUTION

Current density distribution in simulated argon-potassium MHD generator
p0129 A68-27085

Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model
p0130 A68-29186

DEPLOYMENT

American and European solar generator technology development review, discussing roll-up arrays, flexible panels, and storage and deployment system components
p0038 A72-28005

DEPOLARIZATION

Hydrogen depolarized fuel cell for space station prototype carbon dioxide concentrator, describing modular design concept and operation
[ASME PAPER 71-AV-37] p0174 A71-36408

DETONATION WAVES

Minimum required energies for direct initiation of gaseous detonation waves in acetylene-oxygen mixtures
[BM-RY-7061] p0116 N68-12434

DEUTERIUM

Hazard evaluation for deuterium tritium fusion reactor power plant
[ORNL-TM-2822] p0015 N70-37097

DHC 5 AIRCRAFT

Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner
p0074 A72-16600

DIELECTRIC PROPERTIES

Dielectric strength of gas mixtures for electrofluid dynamic generators
p0216 N69-18444

Dielectric and microwave properties of rocks and minerals
p0097 N72-12262

DIELECTRICS

Mechanical to electrical energy conversion of ferromagnetic, paramagnetic and diamagnetic materials by MHD converter and dielectric material by electrocaloric effect
p0128 A68-25934

Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0131 A68-31227

Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0140 A69-14153

Energy storage possibilities of superconductors, and use of dielectric materials
[CEA-R-3243] p0263 N68-15938

DIESEL ENGINES

Increased thermal efficiency and increased Diesel engine size economics
[REPT.-1] p0081 N68-24990

Microorganism growth with petroleum fuels
[AD-680804] p0083 N69-20205

DIFFERENTIAL EQUATIONS

Thermochemical MHD converter performance determined by slug model governed by differential equations
p0130 A68-29901

Impulse induction MHD generator with cylindrical channel, finding differential equations for velocity and current
p0145 A69-23084

Transient response in liquid-metal conduction MHD generators, analyzing constant magnetic field using differential equation
p0150 A69-27506

Differential equations for calculating factors causing spontaneous combustion in coal seams
p0090 N70-16595

DIFFUSION WELDING

Lithium-diffused p-n silicon solar cells of high conversion efficiency and improve resistance to space radiation effects
[NASA-CR-97077] p0051 N68-35814

Developments in vacuum diffusion welding methods and metallurgical applications of solar energy
[NLL-M-22830-(5828.4F)] p0067 N73-20584

DIGITAL COMPUTERS

Mathematical simulation of solution-gas drive performance of volatile oil reservoir using digital computer
p0080 N68-21048

Description and evaluation of digital computer program for analysis of Lundell alternators
[NASA-TN-D-5814] p0233 N70-28433

DIGITAL SIMULATION

MHD power generators analytical modeling by digital technique for prediction of performance and efficiency as function of size and operating conditions
[AD-741173] p0179 A72-29355

DIGITAL TECHNIQUES

Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output
p0172 A71-23441

DILUENTS

Diluent gas effect on alkali metal seeded rare gas nonequilibrium plasmas conductivity at various pressures, noting working fluid suitability in MHD generators
p0123 A68-20829

DIMENSIONAL ANALYSIS

Determining dimensions of MHD channel
[SM-74/242] p0213 A69-13350

DIODES

Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage
p0164 A70-21274
Thermionic energy conversion with a Ba-Cs-diode.
p0180 A72-34603

DIPHENYL COMPOUNDS

Test evaluation of monoisopropyl diphenyl, and gas oil as organic reactor moderators
[PTD-HT-66-746] p0079 A68-12884

DIRECT CURRENT

Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field
p0157 A69-39027

Series inverter silicon controlled rectifier 2800 watt dc power supply, noting high efficiency, low weight and stable voltage regulation
p0176 A72-11064

Kilowatt rotary dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics
p0178 A72-21410

Combustion-driven magnetogasdynamic power generator designed to obtain direct current electric power generation data under thermal steady state conditions
p0202 A68-23346

Modification of dc motor with magnetically suspended rotor to increase momentum storage capacity
[NASA-CR-115792] p0266 A71-13514

Direct current powered self repeating plasma accelerator with interconnected annular and linear discharge channels
[NASA-CASE-XLA-03103] p0240 A71-21693

Feedback controlled dc to dc converter with input/output isolation for voltage regulation
[NASA-CASE-HQM-10792-1] p0248 A72-27230

DIRECT POWER GENERATORS

Thermoelectric converters for direct thermal to electric energy conversion, citing SNAP isotopic generator space power systems
p0119 A68-11240

Design and performance of explosive driven magnetic generators, giving line drawings and current oscillograms
p0120 A68-15139

Book on direct energy conversion covering photovoltaic conversion, thermoelectric generators, thermionic converters, radionuclide batteries and galvanic fuels, etc
p0121 A68-17791

Problems and various processes of direct energy conversion covering thermoelectric, MHD generators, radionuclide batteries, thermionic converters and galvanic cells
p0121 A68-17792

Efficiency and performance limiting factors of single crystal and polycrystalline thin film cells
p0121 A68-17793

Thermoelectric generator design using ultrasonic atomizing burner and SiGe converter
p0121 A68-17827

Electrofluid dynamic energy conversion processes for direct power generation, discussing performance characteristics, working medium properties, etc
[AGARDOGRAPH 81] p0124 A68-22534

Performance characteristics of electroballistic direct power generators
[AGARDOGRAPH 81] p0124 A68-22536

Experimental techniques in electrofluid dynamic power generation, discussing energy transfer, ion generation, configuration effects, scaling characteristics and closed cycle operation
[AGARDOGRAPH 81] p0124 A68-22538

Thermodynamic theory of irreversible processes in thermoelectric conversion, discussing Thomson and Peltier effects and ideal generator
[AGARDOGRAPH 81] p0125 A68-22539

Electrochemical and chemical catalysis differences due to applied field and solvent, discussing fuel cell reaction rates enhancement in electrochemical energy conversion
[AGARDOGRAPH 81] p0261 A68-22542

Electrostatic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0131 A68-31227

Satellite power generation and transmission system for solar energy conversion, noting estimates of surface area and weight of collectors
p0026 A69-12296

Electrostatic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0140 A69-14153

Fuel cells utilizing direct electrochemical conversion of energy of radioactive elements
p0142 A69-21054

MHD energy converters electric fields and current distributions, analyzing MHD flow problems
p0157 A69-39480

High temperature solar energy converter cavity absorbers geometry, considering absorption parameters of radiation reflected by concentrator
p0030 A70-10761

Electrostatic energy converter load current analysis, deriving expression for space charge electric field with axially varying or constant charge distribution
p0165 A70-25036

Electrostatic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures
p0165 A70-27330

Electrostatic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures
p0170 A70-42071

Book on batteries and energy systems covering theoretical concepts, construction, operation principles, characteristics and applications of various types of primary and secondary cells
p0262 A70-42454

Book on fuel cells covering types, applications, thermodynamics, chemical reactions, direct electrical generation, etc
p0171 A71-11192

Electrofluid dynamic direct energy conversion, discussing working media, duct geometry, unipolar charges, and fluidic switches
[ASME PAPER 70-ENER-A] p0171 A71-13704

Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystem
p0173 A71-30801

Test facility and performance predictions for Rankine cycle power system components, including lithium heater, potassium boiler, condenser and preheater
[GE5P-451] p0173 A71-32223

High efficiency solar electricity converters utilizing wave-like properties of radiation interacting with absorber-converter elements, discussing cost and fabrication advantages
[ASME PAPER 71-WA/SOL-1] p0036 A72-15891

Radioisotopic energy conversion by radiovoltaic effect, describing titanium-tritium sources and semiconductor converter
p0185 A73-23278

SUBJECT INDEX

EARTH (PLANET)

A model of a thermophotovoltaic radionuclide battery. p0185 A73-23279

Explosive devices for converting explosive energy into magnetic fields for direct power generators [UCRL-TRANS-10133] p0192 N68-14541

Solar cells, radioisotope generators, fission electric cells, and thermionic converters considered for Jupiter spacecraft mission p0201 N68-21480

Design and performance of silicon solar cells for electrical power generation [NASA FACTS S-6/3-68] p0051 N68-31526

NASA derived direct energy conversion processes for possible utilization by electric power industry p0208 N69-12585

Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators [AGARDOGRAPH-122] p0215 N69-18439

Performance characteristics of electrofluid dynamic generators p0215 N69-18441

Physical and theoretical aspects of viscous electrofluid dynamic energy conversion processes p0216 N69-18442

Dielectric strength of gas mixtures for electrofluid dynamic generators p0216 N69-18444

Approximative solution for charge cloud growth in electrofluid dynamic generator p0216 N69-18445

Research on electrofluid dynamic energy conversion in Belgium p0216 N69-18446

Design and construction of magnetogasdynamic plasma power generator in Canada p0216 N69-18447

Electrical isotopic generator in milliwatt range [CEA-R-3834] p0225 N69-40586

Spacecraft power supply design with emphasis on converter design p0057 N70-24832

Fundamental processes occurring in thermionic energy converters related to overall converter performance [AD-700945] p0232 N70-26947

Development of plasma diagnostic methods applied to direct energy converters [AD-702405] p0233 N70-29012

Direct conversion of thermal energy into electrical energy using crossed electric and magnetic fields [NASA-CASE-XLE-00212] p0235 N70-34134

Direct conversion of fusion power to electricity and reduction of waste heat in reactors [TID-25414] p0237 N70-39141

Describing general characteristics of system for direct conversion of thermal into electrical energy by thermodynamic analysis p0239 N71-13249

Experimental and computational investigations of direct conversion of plasma energy to electricity [CONF-710607-126] p0244 N71-38463

Tests of cadmium sulfide solar cells under simulated space environmental conditions [NASA-CR-120840] p0063 N72-14029

Direct thermal energy conversion using thermal absorption principle [NASA-CASE-ARC-10461-1] p0252 N73-20931

DISSOCIATION
Nuclear energy in hydrogen production by water dissociation method [EUR-4838] p0020 N73-15699

DISTANCE
Flight range and fuel consumption formulas of power gliders used for transportation compared with automobiles p0073 A69-43142

DISTILLATION EQUIPMENT
Radioisotopes to provide thermal energy for vacuum distillation and vacuum distillation-vapor pyrolysis in life support systems [AMBL-TR-67-158] p0080 N68-21041

DISTRIBUTING
Distribution of current on electrodes in magnetohydrodynamic channel [SU-IPR-230] p0205 N68-31787

DISTRIBUTION (PROPERTY)
MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters p0149 A69-27499

DIURNAL VARIATIONS
Analysis of the parameters of solar-heat power sources with energy storage units p0045 A73-34283

DOCUMENTATION
Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast p0096 N71-35178

DONOR MATERIALS
Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination p0027 A69-35679

DRAINAGE
Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania [E73-11112] p0112 N73-33269

DRILLING
Seven kilometer oil drilling rig p0092 N70-24796

DUCTED FLOW
Open cycle MHD generators optimization, predicting thermodynamic properties, electrical loading, etc p0133 A68-39724

Current and voltage distribution around normal shock in MHD duct using conformal transformation, considering continuous and segmented electrode boundary conditions p0146 A69-25359

MHD power generation, investigating replenishment of zirconia electrodes from plasma in open flame and duct configurations p0166 A70-30535

Plasma inhomogeneities effects on MHD generators I-V characteristics, energy conversion efficiency and optimum duct geometry p0167 A70-39636

DUCTS
Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output p0172 A71-23441

Liquid metal magnetohydrodynamic generator hydraulic losses and duct flow [NASA-CR-97879] p0209 N69-13288

DURABILITY
Undersea warfare energy systems of extended endurance [AD-681068] p0217 N69-20548

DUST
Radioactive dust in air at KUR operation from fission production of fuels and activated aerosols [KURRI-TR-56] p0091 N70-21010

DYNAMIC MODELS
Linear solar collector conversion efficiency over wide operating temperature range via model consisting of long pipe with energy injection at points along length [ASME PAPER 72-WA/SOL-7] p0042 A73-15802

Nonlinear dynamic model of nuclear power plants with single-phase coolant reactors [AE-3411] p0217 N69-21373

Systems model used to determine dynamic behavior of nuclear closed cycle, gas turbine plant with high temperature reactor [NLL-WH-TRANS-271-/9091.9F/] p0230 N70-21100

DYNAMIC PROGRAMMING
Minimal energy stochastic controller design for electrically driven vehicles, using dynamic programming p0177 A72-17304

E

EARTH (PLANET)
Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants [JPRS-53174] p0016 N71-26623

EARTH CORE

SUBJECT INDEX

- Heliotekhnique for utilizing solar energy on earth
p0069 N73-33763
- EARTH CORE**
Pressure effects on filtration and permeability of
heat carriers in earth core rocks
p0090 N70-16589
- EARTH CRUST**
ERTS-1 imagery of geostructures of Alaskan
continental crust and relation to mineral
resources
[E73-10321] p0105 N73-18353
Identification of geostructures of continental
crust in Alaska and relation to mineral
resources and exploration
[E73-11035] p0112 N73-31339
- EARTH ORBITS**
Electrical power systems for earth orbiting missions
[AD-701352] p0233 N70-29518
- EARTH PLANETARY STRUCTURE**
Gravimetric surveys of Monzbukly structure in
relation to oil and gas deposits
[ACIC-TC-1217] p0078 N68-10240
- EARTH RESOURCES**
Potential applications of nuclear explosives to
recover geothermal energy
[USGS-289-1] p0088 N70-12921
Natural resource and industrial programs for
nuclear fuel research
[NASA-CR-107560] p0089 N70-15491
Design of multispectral scanner for orbital earth
resources detection
[NASA-CR-102111] p0089 N70-16407
Transactions on Soviet mining therapeutics, and
economics of extracting and using thermal energy
sources
p0089 N70-16584
Thermal water resources in Transcarpathin region
of Ukraine
p0090 N70-16586
Temperature measurements and thermal energy
potential of deep boreholes in petroleum-bearing
regions of Ukraine
p0090 N70-16587
Cost analysis for geothermal boiler installation
for mining thermal heat sources
p0090 N70-16590
Outer continental shelf lands of United States -
Vol. 1, international considerations and federal
jurisdiction
[PB-188714] p0014 N70-25747
Outer continental shelf lands of United States -
Vol. 2, legal and resource aspects
[PB-188715] p0014 N70-25748
Outer continental shelf lands of United States -
Vol. 3, resource aspects, user interaction and
environmental impact, analyses
[PB-188716] p0014 N70-25749
Outer continental shelf lands of United States -
Vol. 4, appendices on legal matters
[PB-188717] p0015 N70-25750
Outer continental shelf lands of United States -
Vol. 5, appendices including bibliography,
questionnaire to industry, oil and gas lease
notices, and comparative laws and policies
[PB-188718] p0015 N70-25751
Outer continental shelf lands of United States -
Vol. 6, appendices including offshore mineral
leasing acts, foreign laws and policies, and
compilation of alternatives
[PB-188719] p0015 N70-25752
Arctic manpower, industrial, mineral, petroleum,
and transportation resources
[AD-716415] p0094 N71-19770
Management planning in Sweden for natural gas as
industrial energy source
[IVA-MEDD-167] p0096 N71-30522
Effect of earth resource utilization on
environmental engineering, considering economics
and transportation factors
p0018 N72-13956
Correlation spectrometry from aircraft, balloons,
and satellites applied to oil and mineral
exploration and air pollution detection
p0099 N72-23284
Exploration of nonagricultural earth resources of
economic significance by United Nations in
developing countries
p0099 N72-23295
- Briefings on energy sources, resources, and research
p0018 N72-25929
Review of resources of fossil and nuclear fuels,
solar energy and hydroelectric power
[LRP-63/73] p0021 N73-30975
Space applications research in astronomy and earth
physics
[NASA-SP-331] p0021 N73-31867
- EARTH RESOURCES PROGRAM**
Satellite monitoring of open pit mining operations
[BN-TC-8530] p0107 N73-24432
- EARTH RESOURCES TECHNOLOGY SATELLITE 1**
Geological mapping of New York State based on
ERTS-A imagery
[E72-10020] p0101 N72-29272
Ecological effects of strip mining in Ohio based
on interpretation of ERTS-1 imagery
[E72-10069] p0101 N72-31353
Application of ERTS-1 imagery to fracture related
mine safety hazards in coal mining industry
[E72-10064] p0102 N72-32336
Application of ERTS-1 imagery to fracture related
mine safety hazards in coal mining industry in
Indiana
[E72-10193] p0102 N73-10372
Analysis of ERTS-1 imagery of Northern Coast
Ranges and Sacramento Valley, California for
locating mercury deposits and oil and gas fields
[PAPER-G18] p0109 N73-28249
Application of ERTS-1 imagery to determine
geological evidence of mineral and hydrocarbon
accumulations in Alaska, Canada, Montana,
Colorado, New Mexico, and Texas
[PAPER-G30] p0109 N73-28261
Application of ERTS-1 imagery to determine
ecological effects of strip mining in eastern Ohio
[PAPER-E2] p0109 N73-28266
Digital processing of ERTS-1 data for
identification of strip mining areas in west
branch area of Susquehanna River and mine
drainage in Pennsylvania
[PAPER-E3] p0110 N73-28267
Digital analysis of ERTS-1 data to determine
sedimentation levels in Potomac and Anacostia
Rivers confluence and strip mining in Allegheny
County, Maryland
[PAPER-E13] p0110 N73-28277
Identification and mapping of coal refuse banks in
Pennsylvania anthracite coal fields from ERTS-1
data
[PAPER-L24] p0110 N73-28319
Application of ERTS-1 imagery to resource
management in Ohio
[PAPER-R3] p0110 N73-28361
Mapping of strip mine areas in southeastern Ohio
from ERTS-1 imagery
p0110 N73-28372
- EARTH SATELLITES**
Satellite-aircraft approach to oil detection and
rock identification in North and South America
[NASA-CR-101384] p0084 N69-28160
- EARTH SURFACE**
Aerial infrared scanner to locate and detect
subsurface coal fires
p0086 N69-33683
- ECOLOGY**
Ecological significance of utilization of waste
heat generated by rubbish combustion, industrial
furnaces, electrical fixtures and human beings
p0071 A68-21940
Rotary wing aircraft ecological advantages in
logging, off shore oil exploration and short
haul passenger transport for airport size
reduction
p0076 A73-33185
Oil spill incidents and oil pollution effects on
biological systems and earth ecology bibliography
[PB-188206] p0014 N70-21569
Outer continental shelf lands of United States -
Vol. 3, resource aspects, user interaction and
environmental impact, analyses
[PB-188716] p0014 N70-25749
Effect of energy demands on ecology and efforts to
preserve environment from degradation and
contamination
[BN-16228] p0018 N72-20371
Ecological effects of strip mining in Ohio based
on interpretation of ERTS-1 imagery
[E72-10069] p0101 N72-31353

SUBJECT INDEX

ELECTRIC CELLS

Mapping ecological effects of coal strip mining in Ohio
[E72-10256] p0102 N73-12356

Environmental and ecological effects of coal strip mining in Ohio
[E73-10003] p0019 N73-15339

Ecological effects of coal strip mining in Ohio
[E73-10430] p0106 N73-20391

Application of ERTS-1 imagery to determine ecological effects of strip mining in eastern Ohio
[PAPER-82] p0109 N73-28266

ECONOMIC ANALYSIS

Cost efficiency and relative economic merits prediction for solar energy conversion systems
p0037 A72-24316

Economic analysis of silicon solar cells production noting cost reduction from feasibility studies of edge defined film fed crystal growth in ribbon form
p0041 A73-14251

Calculation and comparison of the economics of electrochemical fuel cells
p0185 A73-25346

Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases
[PB-198775] p0017 N71-32624

Legal, economic, and technical aspects of liability and financial responsibility of oil pollution
[PB-198776] p0017 N71-32625

ECONOMIC FACTORS

Economically viable and socially acceptable second-generation SST, discussing technological developments for range/payload, airport noise and sonic boom improvements
[AIAA PAPER 73-15] p0009 A73-17608

Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields
p0257 A73-33183

Hypersonic transports - Economics and environmental effects.
p0009 A73-34435

ECONOMICS

Economics and handling nuclear fuel systems for power reactors
[CPA-CONF-1093] p0257 N69-27096

Economic fabrication of nuclear fuel-uranium monocarbide for reactors
[EUR-4273.D] p0086 N69-34967

Cost estimates for nuclear energy and heat use in various industrial plant processes
p0013 N70-14504

Economic utilization of nuclear power plants in chemical and industrial centers
p0014 N70-14506

Nuclear power plant energy for heating urban center
p0227 N70-14518

Outer continental shelf lands of United States - Vol. 3, resource aspects, user interaction and environmental impact, analyses
[PB-198716] p0014 N70-25749

Economics of using gelled fuels in commercial jet transport
[FAA-WA-70-45] p0093 N70-34002

Future aircraft fuel resource availability and pricing, processing methods, and economic projections for period 1970 to 2000
[NASA-TM-X-62180] p0102 N72-32742

Congressional hearings on earthbound potential utilization of solar energy
p0066 N73-14812

ECONOMY

Contributions of NASA sponsored programs dealing with electroforming, Ni-Cd-Zn-Ag batteries, refractory alloys, fuel cells, solar cells, and stress corrosion in titanium alloys
[NASA-CR-96813] p0011 N68-34388

EFFICIENCY

Fringing losses and efficiency of finite length magnetohydrodynamic traveling wave cylindrical accelerator or generator
p0204 N68-30018

EFFLUENTS

Prediction of effective stack height and corresponding ground level concentrations of effluents emitted from stack
[PHL-PUBL-71-14] p0098 N72-16934

ELDO LAUNCH VEHICLE

Solar cell panel configuration on ELDO launch vehicle
[REPT-RT-68/719] p0057 N70-17439

ELECTRIC ARCS

Electric arcs in ionized and nonionized gas stream
[SM-74/238] p0213 N69-13347

ELECTRIC BATTERIES

Collector temperature influence on maximum efficiency of thermionic converter in series battery
p0025 A68-43817

Book on batteries and energy systems covering theoretical concepts, construction, operation principles, characteristics and applications of various types of primary and secondary cells
p0262 A70-42454

Batteries and fuel cells as portable and transportable electrochemical power sources
p0171 A70-46399

High energy long shelf life lithium-nickel sulfide batteries performance tests
p0262 A71-13041

Integrated high voltage CdS solar batteries with interconnected cells in series without grid
p0034 A71-16058

Parallel operation of the solar generator and battery on the Symphonie satellite
p0039 A72-36681

A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.
p0186 A73-25984

Review of electrochemical power sources for space systems and assessment of technology transfer possibilities
[NASA-TM-X-60795] p0263 N68-14818

Development status and feasibility of battery powered vehicles
[PB-174982] p0193 N68-15499

Fuel cell-battery hybrid power source for electric cars
[AD-662235] p0193 N68-15525

Fuel cell-battery hybrid power source for automobiles
[AD-662236] p0193 N68-15641

Battery and fuel cell power sources for electric cars
[ECOM-2929] p0202 N68-23140

Systems analysis of modular energy storage unit for improved reliability of battery power system
p0264 N69-12431

NASA development work on high efficiency batteries for space electric power systems
[NASA-SP-172] p0265 N69-18042

Design and performance data of power subsystem in flight spacecraft Lunar Orbiter 3
[NASA-CR-100700] p0054 N69-29374

Reports on electric automobiles, plasma spraying, sintering, and vapor deposition thickness measurements
p0265 N69-34688

State-of-art in development of battery power sources for automobiles
p0265 N69-34689

Conference on fuel cells and batteries
[AD-718833] p0016 N71-23353

Computer estimates of weight, cost, and reliability of six battery configurations
[NASA-CR-122296] p0266 N72-11982

Performance capabilities and cycle life of high specific energy batteries for pollution free electric vehicles
[ANL-7953] p0267 N73-19061

Use of lithium/sulfur batteries as load-leveling devices in electrical utility networks
[ANL-7958] p0268 N73-30058

ELECTRIC CELLS

Fuel cell system performance related to reactant properties, tabulating values for cell design factors
[AGARDOGRAPH 81] p0125 A68-22541

ELECTRIC CONDUCTORS

SUBJECT INDEX

- Expanding and contracting connector strip for solar cell array of Nimbus satellite
[NASA-CASE-X65-01395] p0053 N69-21539
- Design and utilization of fuel and electric cells and heat engines
[AD-743651] p0249 N72-33065
- ELECTRIC CONDUCTORS**
- Traveling transverse magnetic field interaction with rigid conducting spheres or cylinders, discussing electromechanical characteristics and MHD energy conversion applications
p0129 A68-26140
- Superconducting magnetic systems reliability engineering and design, noting combined conductors for uncontrolled transition prevention in normal state under subcritical currents
p0182 A73-10616
- Electric conductivity in argon potassium and helium potassium plasmas with elevated electron temperature in crossed electric and magnetic fields
[IPP-3/59] p0190 N68-10892
- ELECTRIC CONTACTS**
- STAR /Stud and Rocker Panel/ four couple section improved by incorporating bonded tungsten electrical contacts for PbTe thermoelectric elements
p0162 A69-42261
- Solar cells with improved photoelectric efficiency, describing use of noncorroding Ti-Pd-Ag contacts, titanium oxide antireflection layer and welded cell joints
p0037 A72-17751
- Design and fabrication of wraparound contact silicon solar cells
[NASA-CR-121003] p0067 N73-20048
- ELECTRIC CORONA**
- Unipolar ions or charged colloids generation in high speed gaseous working media for electrofluid dynamic energy conversion, discussing corona discharge configurations
[AGARDOGRAPH 81] p0124 A68-22537
- Ion generation by corona discharge in electrofluid dynamic energy conversion
p0198 N68-17817
- ELECTRIC CURRENT**
- Impulse induction MHD generator with cylindrical channel, finding differential equations for velocity and current
p0145 A69-23484
- Bayesian decision theory, discussing choice of possible systems to convert wind into electrical energy
p0074 A71-33291
- Effect of heterogeneity and Hall current on the MHD power generator.
p0182 A73-10434
- Superconducting magnetic systems reliability engineering and design, noting combined conductors for uncontrolled transition prevention in normal state under subcritical currents
p0182 A73-10616
- Hall current effects in the Lewis magnetohydrodynamic generator.
p0184 A73-22823
- Design and performance of silicon solar cells for electrical power generation
[NASA FACTS 5-6/3-68] p0051 N68-31526
- Distribution of current on electrodes in magnetohydrodynamic channel
[SU-IPR-230] p0205 N68-31787
- Electrode geometry effect on current and potential in magnetohydrodynamic generators
[IPP-3/68] p0207 N68-38458
- Electrical behavior of various magnetohydrodynamic generators using explosives
[CEA-R-3714] p0222 N69-30078
- Standard solar cells calibrated in respect of air mass zero short circuit current
[ESRO-TN-79] p0058 N70-30210
- ELECTRIC ENERGY STORAGE**
- Solar energy storage optimization for satellite and space vehicle power systems, discussing thermal collection in heat sinks and electric batteries
p0261 A68-43812
- Energy conversion efficiency of thermal and electric regenerative fuel cells
p0203 N68-28735
- Eight static and dynamic energy conversion systems for spacecraft power sources for future missions
p0203 N68-28748
- Photovoltaic cells for converting solar energy to electrical energy
p0056 N70-16228
- Optimal systems for storage of solar energy after thermal conversion
p0056 N70-16229
- Primary energy storage and advanced flywheel configurations with application to urban electric vehicles
[AD-697906] p0265 N70-22537
- ELECTRIC EQUIPMENT**
- Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems
[SAB-679-3] p0191 N68-10967
- Parameter analysis of electric power distribution and conditioning systems of Rankine type space nuclear power plants
[NAED-67-45E] p0206 N68-32748
- Development of solar energy powered heliostats assembly to orient solar array toward sun
[NASA-CASE-GSC-10945-1] p0065 N72-31637
- Design, development, and evaluation of roll-up solar array rated at thirty watts per pound
[NASA-CR-128196] p0065 N72-32070
- ELECTRIC EQUIPMENT TESTS**
- Testing, fabrication, configuration selection, and electrical performance calculations in solar thermionic generator development
[NASA-CR-92520] p0047 N68-16074
- Solar panel test set for testing solar cells with artificial light source
[AD-707345] p0059 N70-38216
- ELECTRIC FIELD STRENGTH**
- Electrostatic energy converter load current analysis, deriving expression for space charge electric field with axially varying or constant charge distribution
p0165 A70-25036
- Nonequilibrium ionization in magnetohydrodynamic conversion generators
p0186 A73-28071
- ELECTRIC FIELDS**
- Two dimensional analysis of end region of single load crossconnected MHD generator, noting grading resistors use to remove infinite concentrations
p0128 A68-25596
- MHD power generator using nonequilibrium plasma generated by inductively coupled RF electric fields, noting plasma diagnostic techniques
p0133 A68-41161
- Closed cycle MHD experiments with applied electric and magnetic fields emphasizing current leakage, segmentation, relaxation and aerodynamic effects
p0145 A69-23479
- MHD generator performance operating on nonequilibrium Ar plasma with K additions in presence of electric fields
p0145 A69-23480
- MHD energy converters electric fields and current distributions, analyzing MHD flow problems
p0157 A69-39480
- Electric field in magnetohydrodynamic channel of rectangular section with semiterminal electrodes
[NASA-TT-P-12010] p0214 N69-14070
- ELECTRIC GENERATORS**
- Radioisotope power subsystems for space, examining performance, heat source design, power conversion methods and efficiencies
p0119 A68-10231
- Operating principles of conventional and exotic electrochemical energy generators, stressing solvent electrical activity
p0120 A68-14861
- Kaufman electrical generator for use with solar cells in SERT 2 mission
p0023 A68-15882
- MHD power generation principles, considering increase of electric conductivity and stability
p0121 A68-17797

SUBJECT INDEX

ELECTRIC GENERATORS CONTD

Performance characteristics of electrofluid dynamic energy conversion processes, using viscous coupling between neutral molecules and electrically charged particles
[AGARDOGRAPH 81] p0124 A68-22535

Photovoltaic cell geometrical and electrical parameters analysis, considering conversion efficiency and spectral adaptation
[AGARDOGRAPH 81] p0125 A68-22548

Edge irradiated p-i-n structure for use with high intensity controlled spectrum photovoltaic converters, considering output, series resistance and collection efficiencies
[AGARDOGRAPH 81] p0126 A68-22549

Energy source, power conversion, heat rejection and power conditioning and distribution subsystems constituting secondary power conversion systems p0129 A68-29145

Single cell batteries with low input voltage conversion regulation considered as long life energy storage system, noting circuit integration p0138 A68-42571

Thermodynamic cycle and optimum conditions of electric power source of MHD generator in combination with thermocompressor p0142 A69-21592

High power giant pulse YAG laser using nonlinear material to achieve complete second harmonic conversion in intracavity experiment p0163 A70-16470

EGD energy converter system geometries for maximum power efficiencies, comparing slender conversion channels, abrupt expansion, free jet and divergent for operating characteristics p0167 A70-30536

Axial pressure, electric current and potential distribution in two-phase particulate electrodynamic flow, discussing space charge electric field effect p0170 A70-40257

Electrically-heated Brayton power conversion system, comparing performance tests with prediction p0173 A71-32212

Incore thermionic reactor as low cost power supply for direct-to-home TV satellite, converting thermal power to electrical without moving masses p0173 A71-32853

NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects [AIAA PAPER 71-825] p0174 A71-34720

Brayton cycle power conversion system using He-Xe gas mixture, discussing compressor net engine and turbine static efficiencies p0175 A71-38908

Electrical subsystem of 2-15 kW Brayton power conversion system consisting of speed controller, alternator voltage regulator, DC power supply, etc p0175 A71-38910

Nuclear energy value to society, stressing usefulness for electric power generation and marine propulsion p0177 A72-14376

Radiovoltaic generator energy conversion by thin film solar cells, noting performance dependence on semiconductor band gap and radioisotope characteristics p0038 A72-28021

Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination p0039 A72-34264

Liquid or solid propellant hot gas turbines as power source for hydraulic and electrical energy p0181 A72-36558

Design point characteristics of a 500 - 2500 watt isotope-Brayton power system. [AIAA PAPER 72-1059] p0182 A73-13388

Spacecraft dynamic solar electric power/thermal control system with cold liquid flow and regenerator cooling for energy conversion efficiency and weight characteristics improvements p0043 A73-22785

Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity p0185 A73-23473

Evaluation testing of a closed Brayton-cycle electrical-power-conversion system. p0185 A73-25983

Large area silicon solar array development. p0044 A73-29593

Annotated bibliography on batteries, fuel cells, thermionics, thermoelectrics, nuclear energy sources, and other direct energy conversion concepts adaptable to space vehicles [NASA-TN-X-60877] p0195 A68-17223

Colloquium on energy sources and energy conversion [AGARDOGRAPH-81] p0195 A68-17793

Performance characteristics of electro-ballistic generators for fluid dynamic energy into electric energy p0198 A68-17816

Reactant properties of fuel cells used as chemical energy converters p0198 A68-17821

Peaceful application of nuclear energy [TID-24102] p0010 A68-18394

NASA educational facts on present and future electric power sources for space application [NASA FACTS-NP-38] p0048 A68-19128

Electric power generation and cryogenic gas storage systems for Apollo applications program mission planning [NASA-TN-X-61072] p0048 A68-23182

Economic generation of power from thermonuclear fusion [CLM-R-85] p0202 A68-25016

Dc or low frequency ac conversion of microwave power into electrical power [REPT.-4] p0205 A68-30681

Physical and technical problems of direct conversion of chemical energy into electrical [AD-696897] p0229 A70-18381

Performance tests of 2-15 kilowatt Brayton power system using krypton [NASA-TN-X-52750] p0229 A70-19190

Ultra-reliable power processor for hydrocarbon-air fuel cell power systems [AD-699311] p0231 A70-23985

High voltage generation with beta electrogenerator cell [NASA-TN-X-52776] p0232 A70-26116

Startup testing of SNAP 8 power conversion system [NASA-TN-X-52822] p0233 A70-29864

Brayton cycle power system using dc power supply for space applications [NASA-CR-72529] p0236 A70-36860

Hydrogen-oxygen fuel cell technology for space shuttle electrical power requirements p0237 A70-40974

Isotopic electricity generator studies, including radioactive isotopes, output wattage, generator lifetime, energy conversion, and generator weight [ORNL-TR-2485] p0244 A71-37044

Cost analysis of large scale solar cell power for terrestrial applications [NASA-TN-X-2520] p0063 A72-19057

Feedback controlled dc to dc converter with input/output isolation for voltage regulation [NASA-CASE-HQN-10792-1] p0248 A72-27230

Hearing concerning new technologies for environmentally acceptable generation of electricity p0019 A72-30977

Hydrazine air fuel cell power generating module capable of 120 watts continuous output [AD-744477] p0249 A72-32078

Use of Cm-244 as radioisotope power fuel in electric power conversion systems [CONF-720519-1] p0103 A73-12717

Automatic connection of aerogenerator to electrical network [NASA-TT-P-14873] p0106 A73-21238

Design, development, and performance tests of wind driven, propeller operated electric generation station [NASA-TT-P-15037] p0110 A73-29004

Design, development, and operation of windpowered electric generators for commercial electric power applications [NASA-TT-P-15068] p0111 A73-29008

ELECTRIC IGNITION

SUBJECT INDEX

- Development and construction of wind driven electric power generators for specific European areas
[NASA-TT-P-15050] p0111 N73-29009
- Development of aerodynamic transmission system for use with wind driven electric generators
[NASA-TT-P-15131] p0111 N73-30976
- Device for converting electromagnetic wave energy into electric power
[NASA-CASE-GSC-11394-1] p0254 N73-32109
- ELECTRIC IGNITION**
- Startup testing of SNAP 8 power conversion system
[NASA-TM-X-52822] p0233 N70-29864
- Technology review on electric automobiles p0266 N71-22199
- ELECTRIC MOTORS**
- Numerical analysis method for performance prediction of linear induction machines including liquid metal MHD pumps and generators and linear motors p0179 A72-29365
- Development status and feasibility of battery powered vehicles
[PB-174982] p0193 N68-15499
- Parametric design data on canned ac induction motors for space nuclear electric power systems
[SAN-679-5] p0205 N68-31544
- Modification of dc motor with magnetically suspended rotor to increase momentum storage capacity
[NASA-CR-115792] p0266 N71-13514
- Technology review on electric automobiles p0266 N71-22199
- ELECTRIC NETWORKS**
- Automatic connection of aerogenerator to electrical network
[NASA-TT-P-14873] p0106 N73-21238
- Use of lithium/sulfur batteries as load-leveling devices in electrical utility networks
[ANL-7958] p0268 N73-30058
- ELECTRIC POTENTIAL**
- Electrode end effects on plane flow of electrically conducting fluid in MHD generator, determining current and electrical potential functions p0120 A68-16360
- Stability of MHD generator plasma under potential perturbation waves in ionized component of working body p0121 A68-18285
- Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakages and current distribution p0179 A72-29353
- Current distribution in magnetohydrodynamic generators with two pair of finite length electrodes separated by isolated sections p0192 N68-11664
- Distribution of current on electrodes in magnetohydrodynamic channel
[SU-IPR-230] p0205 N68-31787
- Electrode geometry effect on current and potential in magnetohydrodynamic generators
[IPP-3/68] p0207 N68-38458
- Integral characteristics of MHD generator with diverging electrodes
[AD-694396] p0227 N70-13251
- Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736
- ELECTRIC POWER**
- MHD power plant research and development, discussing shock wave electric power generators and modulated systems p0146 A69-24469
- Piston-like laminar liquid metal flow in MHD generator to increase thermodynamic efficiency of cycle and to generate electricity by synchronous principle p0148 A69-27491
- Thermionic electrical power generation - Conference, Stresa, Italy, May 1968 p0152 A69-29172
- One wavelength MHD induction generator, discussing field pressure gradients, fluid velocities, excitation and electrical output power p0169 A70-40015
- Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth p0035 A71-28665
- High power linear beam tube devices for space power generation station, considering use of klystron with heat pipes for low weight and high efficiency p0035 A71-28669
- Electrical power systems for spacecraft, reviewing solar cells, batteries, fuel cells and radioisotope thermoelectric generators p0174 A71-37122
- MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid p0176 A71-40020
- High efficiency solar electricity converters utilizing wave-like properties of radiation interacting with absorber-converter elements, discussing cost and fabrication advantages
[ASME PAPER 71-WA/SOL-1] p0036 A72-15891
- Pollution free electrical power generation from solar energy, discussing microwave transmission to earth, power shortages, thermal pollution and solar cell manufacture cost
[ASME PAPER 71-WA/SOL-2] p0036 A72-15892
- Kilowatt rotary dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics p0178 A72-21414
- High electric power output Si solar cell development, discussing increased energy conversion efficiency p0038 A72-28026
- One-wavelength MHD induction generator operated on NaK flow system with various excitation conditions, calculating magnetic flux density and power by Fourier series p0179 A72-29364
- Electric power generation by thermionic converters, discussing physical principles of operation and technology utilization in communications, meteorology, geophysics, oceanography and space exploration p0181 A72-39940
- Effect of heterogeneity and Hall current on the MHD power generator. p0182 A73-10434
- Rotating electrical machine superconducting field winding design requirements in terms of size, magnetic energy storage, power level, rotation speed and pole number p0182 A73-11820
- Solar cells with Si Schottky function diode, discussing fabrication and barrier metal and thickness effects on output power and energy conversion efficiency p0042 A73-16816
- The phosphoric acid fuel cell, a long life power source for the low to medium wattage range. p0184 A73-22821
- Laser energy transfer - An analytic survey of high power applications. p0257 A73-22822
- Portable 560-watt thermoelectric power module
[AD-662770] p0193 N68-15230
- Thermoelectric generation of isotopic electric power for radio meteorological stations p0201 N68-21974
- Design and performance of photovoltaic power system on Nimbus 2 spacecraft
[NASA-CR-62045] p0202 N68-24455
- Feasibility of power by nuclear fusion
[ORNL-TM-2204] p0204 N68-30162
- Spacecraft power research and development p0052 N68-37401
- Power systems research reviews at Marshall Space Flight Center p0215 N69-18068
- Magnetohydrodynamic power generator development for commercial application p0221 N69-28597
- Compilation of references on direct conversion of heat into electrical energy
[BLG-427] p0223 N69-32934

SUBJECT INDEX

ELECTRIC POWER PLANTS

Thermonuclear reactions for electric power
 production
 [AD-691465] p0225 N69-40792

Cost estimates for nuclear energy and heat use in
 various industrial plant processes p0013 N70-14504

Low cost energy for sewage water processing and
 reuse p0014 N70-14519

Metallic uranium fueled pressurized water reactors
 for production of process heat or electric power
 [ORNL-TM-2451] p0232 N70-25646

Thermodynamic characteristics of electrochemical
 energy conversion into electrical energy
 [AD-713875] p0240 N71-16314

Development and characteristics of lithium-doped
 solar cells p0060 N71-16472

Design and performance of SERT 2 spacecraft
 electrical power system
 [NASA-TM-X-2234] p0061 N71-20471

Electrical power distribution system and energy
 consumption during long duration operation of
 space station simulator p0258 N71-20975

Analysis of problems created by energy production
 and consumption in highly developed countries
 [ORNL-NSF-EP-3] p0017 N72-11848

Photoelectric, thermoelectric, and thermoelectric
 methods of converting solar to electrical energy
 [AD-747293] p0065 N73-11050

Utilization of space technology to supply earth
 demands for thermal and electric energy
 p0019 N73-13864

Experimental investigations of two-dimensional
 flow problems and electric power generation in
 open cycle vortex MHD generator
 [BM-II-7699] p0251 N73-14746

Congressional hearings on research and development
 of environmentally safe electric power production
 p0020 N73-20976

Magnetohydrodynamic generator for combined
 magnetohydrodynamic electric power plant with
 first generation open cycle
 [AD-764925] p0254 N73-31996

ELECTRIC POWER PLANTS

Operation of 20 Mw Hall MHD generator and
 associated equipment, noting safety precautions
 and devices p0127 A68-23919

Electrical power generation from sunlight without
 pollution, using solar cell elevated rug
 technology p0034 A71-16100

NASA closed cycle MHD facility for power
 generation, discussing system components, design
 and operation
 [AIAA PAPER 72-103] p0177 A72-16936

Large-scale concentration and conversion of solar
 energy. p0039 A72-36075

Electrical and isotope power from space for
 terrestrial use. p0042 A73-18028

Thermionic fuel elements for in-core reactor power
 plant space applications, summarizing operating
 and environmental requirements and technology
 development p0076 A73-22819

Exploratory investigation of an electric power
 plant utilizing a gaseous core reactor with MHD
 conversion. p0184 A73-22829

Near-equatorial synchronous orbit Satellite Solar
 Power Station system with photovoltaic cell
 arrays energy conversion into microwave power
 for transmission to earth p0043 A73-23601

Satellite electric power station for conversion of
 solar energy to microwaves beamed to earth,
 discussing structural design, flight control,
 transportation and technology assessment
 p0044 A73-24554

Thermal mapping at electrical power generating
 sites for outfall from fossil or nuclear fuel
 plants, considering airborne application
 p0076 A73-33360

Some major terrestrial applications of solar energy.
 p0045 A73-35312

High efficiency coal oxidation solid electrolyte
 fuel cell p0192 N68-12477
 [OCR-17]

Fast-breeder reactors as heat sources for nuclear
 electric power generation based on NASA-DERIVED
 technology p0012 N69-12576

Space Rankine cycle power systems technology
 applied to ground-based power systems p0208 N69-12577

Gas turbine engine principles, performance
 improvements, and application to electric power
 generation based on NASA technology p0208 N69-12578

NASA derived direct energy conversion processes
 for possible utilization by electric power
 industry p0208 N69-12585

Conference summary - selected NASA technology in
 electric power industry utilization p0012 N69-12586

System and facility for generating electricity and
 gas from lignite using high temperature nuclear
 reactor [JUL-554-RG] p0264 N69-13298

Effect of output on thermal efficiency in electric
 power stations using MHD generators
 [SM-74/204] p0211 N69-13329

Thermodynamics of two component liquid metal MHD
 power plant with vapor-liquid injector
 [SM-74/218] p0212 N69-13335

Problems in operating MHD generator installation
 [SM-74/221] p0212 N69-13336

Transient processes in superconducting magnets in
 MHD generators [SM-74/229] p0212 N69-13341

Determining dimensions of MHD channel
 [SM-74/242] p0213 N69-13350

Techniques for large scale solar energy conversion
 into electrical power [JPRS-48222] p0054 N69-30038

References on magnetohydrodynamic generators
 [AD-686000] p0222 N69-32347

Present stand and potential use of MHD generators
 for electric power production [FOA-4-C-4325-55] p0223 N69-35224

Nuclear power plants for low cost heat and
 electricity generation p0014 N70-14505

Low cost nuclear power for acetylene manufacture
 p0117 N70-14509

Conceptual designs for radioisotope electric power
 system [ORNL-TM-2366] p0233 N70-29364

Developing magnetohydrodynamic generators for
 production of electrical energy p0236 N70-36136

Developing magnetohydrodynamic generators for
 production of electrical energy p0236 N70-36137

Installations for direct conversion of heat into
 electrical energy by MHD generators and other
 energy devices p0236 N70-37070

MHD methods of obtaining electrical energy
 [AD-706160] p0236 N70-37638

Energy conversion and electric power plants for
 developing countries p0093 N70-38878

Hydrogen oxygen fuel cells for electric power
 plants and Apollo spacecraft [DLR-MIT-70-09] p0239 N71-15723

Feasibility of large-scale terrestrial plants for
 future generation of pollution free electrical
 power from solar energy [NASA-TM-X-65497] p0061 N71-23700

Evaluation of factors affecting performance of
 series connected magnetohydrodynamic generators
 [AD-721455] p0242 N71-28718

Energy sources in US to achieve future electric
 energy needs and environmental compatibility
 requirements p0095 N71-29852

Gas core reactors and MHD generator to solve
 problems of growing demand for electric power
 without thermal pollution p0243 N71-33664

ELECTRIC POWER SUPPLIES

SUBJECT INDEX

- Efficiency of electric power production on MHD generators in nonequilibrium plasma
[AD-724973] p0245 N72-10782
- Gas turbine power plants in future urban energy planning
[RE-439J] p0253 N73-22912
- Functional characteristics and operating data of experimental, aerodynamic three-phase electric power plant constructed in Crimea
[NASA-TT-F-14933] p0107 N73-24268
- Portable open cycle fuel cell power plant capable of operation on military fuels
[AD-764285] p0254 N73-30979
- ELECTRIC POWER SUPPLIES**
- Fuel cells for improved electrical power supply.
[AIAA PAPER 73-82] p0183 A73-17641
- Spacecraft nuclear power source optimization, considering radioisotope and reactor heat sources, cryogenic cooler cycle types and spacecraft design
p0184 A73-22799
- Aerospace MHD large scale power generation
p0250 N73-13865
- Construction, operation, and applications of fuel cells to show advantages and limitations
[NASA-SP-5115] p0253 N73-26045
- Design, development, and performance tests of wind driven, propeller operated electric generation station
[NASA-TT-F-15037] p0110 N73-29004
- Design, development, and operation of windpowered electric generators for commercial electric power applications
[NASA-TT-F-15068] p0111 N73-29008
- Development and construction of wind driven electric power generators for specific European areas
[NASA-TT-F-15050] p0111 N73-29009
- Development of aerodynamic transmission system for use with wind driven electric generators
[NASA-TT-F-15131] p0111 N73-30976
- ELECTRIC POWER TRANSMISSION**
- Parameter analysis of electric power distribution and conditioning systems of Rankine type space nuclear power plants
[NAED-67-45E] p0206 N68-32748
- Developing and improving energy conversion efficiency, electrification, and electric power transmission in U.S.S.R.
[M-7428] p0011 N68-35752
- Ionization instability in disk channel of unbalanced MHD generator, MHD generator boundary layer wall equations, and variational problems of magnetohydrodynamics
[AD-705748] p0235 N70-34959
- ELECTRIC PROPULSION**
- Hydrogen resistojets for primary propulsion of communications satellites.
p0009 A73-15741
- Fuel cell-battery hybrid power source for electric vehicular propulsion
[AD-662234] p0194 N68-15712
- General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power
[FTD-MT-64-355] p0203 N68-26786
- Properties and limitations of chemical and nuclear fuels in aircraft engines
[AD-685535] p0116 N69-29919
- Mission analysis for solar electric propelled spacecraft on Mars Orbiter, Jupiter flyby, and asteroid belt exploration trajectories
[NASA-CR-106089] p0055 N69-38783
- Primary energy storage and advanced flywheel configurations with application to urban electric vehicles
[AD-697906] p0265 N70-22537
- ELECTRIC PULSES**
- Fuel cells power density improvement under pulsed loading at high current density and constant voltage
p0166 A70-27758
- ELECTRIC TERMINALS**
- Electric field in magnetohydrodynamic channel of rectangular section with semiterminal electrodes
[NASA-TT-F-12010] p0214 N69-14070
- ELECTRICAL ENGINEERING**
- Engineering aspects of magnetohydrodynamics
p0241 N71-26458
- ELECTRICAL IMPEDANCE**
- Phase impedance, power factor, performance characteristics, and working fluids studied for magnetohydrodynamic generators
p0204 N68-29990
- Magnetohydrodynamic generator systems analysis including electrical impedance and power conversion efficiency calculations for various designs
p0241 N71-26449
- ELECTRICAL INSULATION**
- Electrical effects of boundary layers on insulator wall of MHD generator, considering equilibrium and nonequilibrium ionization generators performance
p0164 A70-19321
- Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma
p0176 A71-38949
- ELECTRICAL MEASUREMENT**
- Electrical testing of six converter solar energy thermionic generator, discussing overheating and dual current mode anomalies
p0026 A69-21823
- MHD induction generator design, considering electrical and friction loss measurement and control
p0167 A70-39988
- A system for the evaluation of solar cell samples.
p0042 A73-22438
- Computer controlled electrical measuring devices for thermoelectric generator of power plant
[AD-727461] p0244 N71-38010
- ELECTRICAL PROPERTIES**
- Continuous electrode Faraday diagonal conducting wall and Hall MGD accelerators and generators performance characteristics
p0119 A68-12258
- Type III-V gallium arsenide solar cells technological construction and electrical properties
p0023 A68-15419
- Electrical effects of boundary layers on insulator wall of MHD generator, considering equilibrium and nonequilibrium ionization generators performance
p0164 A70-19321
- Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide, discussing preparation methods and photoelectric and electric properties
p0033 A70-36238
- Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties
p0169 A70-40012
- Incore thermionic cell power output limitation and thermal/electrical data determination at steady state operation, considering temperature distribution
p0172 A71-25894
- Electrode size effects on voltage loss and boundary layer conductivity of combustion driven MHD generator
p0173 A71-29880
- Solar to electric energy conversion efficiency and electrical properties of photoconverters using compressed sintered CdS
p0036 A71-44390
- Boundary layer influence and other effects on magnetohydrodynamic generator electrical characteristics
[AD-685536] p0221 N69-29842
- Electrical, thermal, and optical properties of semiconductors associated with energy conversion
[AD-693235] p0056 N70-11427
- Electrical parameter calculation for magnetohydrodynamic generator with variable gas parameters along channel axis
[INR-1107] p0235 N70-33335
- Electrical parameters in Faraday-type MHD generator with nonuniform gas properties in electric field direction
[INR-1096] p0235 N70-33672

- Numerical calculations of electrical parameters in Faraday-type MHD generator with two dimensional gas flow
[INR-1199] p0241 N71-27207
- Effects of nonuniform gas flow on electrical performance of MHD generators
[AEC-TB-7102/3] p0245 N72-11610
- Electrical losses in MHD generator described from separation of flow system
[JUL-742-TP] p0245 N72-11639
- Development, characteristics, and operation of linear, nonequilibrium magnetohydrodynamic generator
[AD-728407] p0246 N72-13211
- Circuit substitution and calculation procedure for determining influence of boundary layer on MHD generator electrical characteristics
[AD-745245] p0249 N72-33063
- MHD generator performance limitation from electrical properties, including conductivity and Hall parameter
p0253 N73-28655
- Characteristics of hydrazine-oxygen fuel cell operating under moderate temperature conditions and various power density concentrations
[AD-764530] p0255 N73-33009
- ELECTRICAL RESISTIVITY**
- Effective conductivity in segmented electrode MHD generator with high electron temperature, using power law for electron collision frequency dependence
p0120 A68-15642
- Electrode size effect on performance of MHD generator with nonuniform electrical conductivity, noting internal impedance sensitivity to electrode size
p0129 A68-27110
- Electrical conductivity tensor effect on ionized gas flow in MHD generator with finite electrodes, discussing Hall current effect
p0130 A68-29598
- Optimization of linear conduction MHD generator with constant cross sectional area channel
p0130 A68-30712
- Plasma MHD power generator, considering seeded gases electrical properties and nonequilibrium ionization in induced electric field, noting rocket driven MHD generators
p0132 A68-37062
- Ar-K plasma studied as possible MHD generator working fluid by investigating influence of emission and external magnetic field on nonequilibrium electrical conductivity
p0143 A69-23441
- Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field
p0157 A69-39027
- Thermoelectric power generator with variable thermal conductivity and electrical resistivity, obtaining steady state temperature distribution, power output and thermal efficiency
p0157 A69-40131
- Magnetohydrodynamic generators with unbalanced conductivity and ionization instability
[FTD-MT-24-205-67] p0206 N68-35442
- Electrical conductivity of two phase liquid metal flow in magnetohydrodynamic generator
[NASA-CR-97872] p0209 N69-13240
- Electrical parameters of synchronous MHD generator with pulsating electrical conductivity of incompressible fluid
[SM-74/210] p0211 N69-13333
- Electrical conductivity of plasma in MHD generator
[SM-74/236] p0213 N69-13346
- Determining dimensions of MHD channel
[SM-74/242] p0213 N69-13350
- Electrical conductivity of methane combustion products with aerosols
[AD-685511] p0222 N69-29923
- Electrical resistivity of liquid lithium saturated with cesium
[NASA-CR-110370] p0233 N70-29729
- Electrical conductivity of plasma on magnetohydrodynamic generator, and spectroscopic analysis of argon and cesium plasma
[AD-703158] p0236 N70-36408

ELECTRICITY

Electricity from MHD - Conference, Warsaw, July 1968, Volume 6

- Magnetohydrodynamic generation of electricity by means of liquid metals using two phase flow
[TH-69-E-06] p0006 A69-39477
- Experimental and computational investigations of direct conversion of plasma energy to electricity
[CONF-710607-126] p0222 N69-31249
- Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity
p0244 N71-38463
- p0022 N73-33928

ELECTRIFICATION

Developing and improving energy conversion efficiency, electrification, and electric power transmission in U.S.S.R.
[N-7428] p0011 N68-35752

ELECTROCATALYSTS

- Electrochemical and chemical catalysis differences due to applied field and solvent, discussing fuel cell reaction rates enhancement in electrochemical energy conversion
[AGARDGRAPH 81] p0261 A68-22542
- Monograph on fuel cells covering thermodynamics, electrode polarization principles, electrocatalysis, system requirements, operational principles and applications
p0178 A72-24700
- Electrocatalysis and fuel cells - Conference, Seattle, December 1970
p0180 A72-33876

ELECTROCHEMICAL CELLS

- Operating principles of conventional and exotic electrochemical energy generators, stressing solvent electrical activity
p0120 A68-14861
- Book on batteries and energy systems covering theoretical concepts, construction, operation principles, characteristics and applications of various types of primary and secondary cells
p0262 A70-42454
- Calculation and comparison of the economics of electrochemical fuel cells
p0185 A73-25346
- Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum.
p0188 A73-38386
- Review of electrochemical power sources for space systems and assessment of technology transfer possibilities
[NASA-TM-X-60795] p0263 N68-14818
- Materials, plasma, and electrochemical research on unconventional energy conversion techniques
[NASA-CR-93979] p0010 N68-21035
- NASA development work on high efficiency batteries for space electric power systems
[NASA-SP-172] p0265 N69-18042
- Ion adsorption mechanism and electrochemical energy conversion on fuel cell electrode
[NASA-CR-100892] p0219 N69-25396
- Economic benefits of electrochemical fuel cells
[NASA-TT-P-15147] p0254 N73-31991
- ELECTROCHEMICAL OXIDATION**
- Chemically regenerative fuel cells, discussing competitiveness with direct fuel cells
p0129 A68-27650

ELECTROCHEMISTRY

- Electrochemical and chemical catalysis differences due to applied field and solvent, discussing fuel cell reaction rates enhancement in electrochemical energy conversion
[AGARDGRAPH 81] p0261 A68-22542
- Bioelectrochemical energy conversion, discussing applications for toxic material identification, powering cardiac pacemakers and electric power generation
[AGARDGRAPH 81] p0125 A68-22545
- Medium temperature fuel cells advantages including improved electrochemical reaction kinetics, water and heat removal
p0156 A69-32417

- Book on fuel cells electrochemistry covering direct energy conversion methods, electrode kinetics, electrocatalysis, organic substances, electrochemical combustion, research techniques, etc
p0166 A70-30100
- Reactant properties of fuel cells used as chemical energy converters
p0198 N68-17821
- Catalysis in electrochemical energy conversion
p0199 N68-17823
- State-of-the-art review on thermodynamics and applications of bioelectrochemical energy conversion processes
p0199 N68-17826
- Materials, plasma, and electrochemical research on unconventional energy conversion techniques [NASA-CR-93979]
p0010 N68-21035
- Thermal diffusion of materials, magnetoplasma studies, and electrochemical processes for purpose of energy conversion by unconventional techniques
[NASA-CR-97473]
p0207 N69-10111
- Materials, plasma, and electrochemical engineering for energy conversion
[NASA-CR-103989]
p0223 N69-34810
- Electrochemical energy storage and electricity generation for space power sources
p0229 N70-16227
- Thermodynamic characteristics of electrochemical energy conversion into electrical energy
[AD-713875]
p0240 N71-16314
- ELECTRODES**
- Effective conductivity in segmented electrode MHD generator with high electron temperature, using power law for electron collision frequency dependence
p0120 A68-15642
- Electrode and boundary layer temperature effects on combustion driven MHD generator, discussing generator configuration
p0126 A68-23911
- Nonuniform current distribution effect on segmented electrode Hall MHD generators and accelerators
p0126 A68-23914
- IV characteristics of water cooled MHD generator stressing metal electrode performance
p0127 A68-23925
- Electrode size effect on performance of MHD generator with nonuniform electrical conductivity, noting internal impedance sensitivity to electrode size
p0129 A68-27110
- Electrode processes effects in MHD generators, using mathematical model
p0139 A68-43071
- Carbon fuel cell technology, describing manufacturing processes for three types of carbon electrodes
p0139 A68-44779
- Electrode size effects on voltage loss and boundary layer conductivity of combustion driven MHD generator
p0173 A71-29880
- Monoograph on fuel cells covering thermodynamics, electrode polarization principles, electrocatalysis, system requirements, operational principles and applications
p0178 A72-24700
- Thermal-to-electric power conversion efficiency of nonequilibrium MHD generator with Cs seeded noble gases, considering electrode configuration and gas dynamic effects
p0179 A72-29356
- Current distribution in magnetohydrodynamic generators with two pair of finite length electrodes separated by isolated sections
p0192 N68-11664
- Oxygen electrode kinetic factors in fuel cell energy conversion processes
p0199 N68-17824
- Oxygen electrodes for fuel cells, and mechanism in transport of oxygen near line separating gas electrolyte electrode
p0200 N68-18025
- Electrode geometry effect on current and potential in magnetohydrodynamic generators
[IFP-3/68]
p0207 N68-38458
- Study of metallic and ceramic electrodes in MHD generator
[SM-74/62]
p0210 N69-13315
- Emission characteristics of refractories and magnetic field influence on current distribution along electrodes - MHD generators
[SM-74/92]
p0210 N69-13319
- Volt-Ampere characteristics of MHD channel with different electrodes
[SM-74/209]
p0211 N69-13332
- Hall effect in MHD channels with segmented electrodes
[SM-74/248]
p0213 N69-13352
- Electric field in magnetohydrodynamic channel of rectangular section with semiterminal electrodes
[NASA-TT-F-12010]
p0214 N69-14070
- Oxygen sensing and recombination electrodes tested for fuel cell application
[NASA-CR-100813]
p0265 N69-24894
- Electrode temperature effect on MHD generator performance
[AD-683793]
p0220 N69-27071
- Molybdenum electrode size effect on performance of magnetohydrodynamic generator
[AD-694039]
p0228 N70-14933
- Physical and technical problems of direct conversion of chemical energy into electrical
[AD-696497]
p0229 N70-18341
- Gas parameters in ideal magnetohydrodynamic generators with infinite electrode segmentation
[IFP-3/97]
p0230 N70-21895
- Development and evaluation of oxide electrode materials for use with open cycle magnetohydrodynamic generator
p0243 N71-35627
- Development, characteristics, and operation of linear, nonequilibrium magnetohydrodynamic generator
[AD-728407]
p0246 N72-13211
- ELECTRODYNAMICS**
- Direct electrofluid dynamic energy conversion for space power applications
p0197 N68-17814
- Electrofluid dynamic energy conversion processes using viscous coupling between neutral molecules and electrically charged particles
p0198 N68-17815
- Performance characteristics of electro-ballistic generators for fluid dynamic energy into electric energy
p0198 N68-17816
- Ion generation by corona discharge in electrofluid dynamic energy conversion
p0198 N68-17817
- Experimental equipment and testing methods for electrofluid dynamic energy conversion
p0198 N68-17818
- Friction losses and efficiency of finite length magnetohydrodynamic traveling wave cylindrical accelerator or generator
p0204 N68-30018
- Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics
[AD-674611]
p0012 N69-13314
- Applicability of electrodynamic approximation in theory of liquid metal MHD energy converters
[SM-74/240]
p0213 N69-13348
- Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators
[AGARDOGRAPH-122]
p0215 N69-18439
- ELECTROFORMING**
- Solar energy concentrator technology, design, and fabrication techniques
[NASA-TN-X-59043]
p0049 N68-27643
- ELECTROHYDRODYNAMICS**
- Electrofluid dynamic energy conversion processes for direct power generation, discussing performance characteristics, working medium properties, etc
[AGARDOGRAPH 81]
p0124 A68-22534
- Performance characteristics of electrofluid dynamic energy conversion processes, using viscous coupling between neutral molecules and electrically charged particles
[AGARDOGRAPH 81]
p0124 A68-22535

- Performance characteristics of electroballistic direct power generators
[AGARDOGRAPH 81] p0124 A68-22536
- Unipolar ions or charged colloids generation in high speed gaseous working media for electrofluid dynamic energy conversion, discussing corona discharge configurations
[AGARDOGRAPH 81] p0124 A68-22537
- Experimental techniques in electrofluid dynamic power generation, discussing energy transfer, ion generation, configuration effects, scaling characteristics and closed cycle operation
[AGARDOGRAPH 81] p0124 A68-22538
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0131 A68-31227
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0140 A69-14153
- Electrofluid dynamic direct energy conversion, discussing working media, duct geometry, unipolar charges, and fluidic switches
[ASME PAPER 70-ENER-A] p0171 A71-13704
- ELECTROLYSIS**
- Electrolytic hydrogen fuel production with solid polymer electrolyte technology.
p0116 A73-38413
- Parametric performance and design criteria for assessing feasibility of large solar array and fuel cell systems as primary power source for lunar-based water electrolysis system
[NASA-CR-61979] p0051 N68-36000
- Low cost nuclear energy for production of electrolytic ammonia
p0117 N70-14512
- Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system
[NASA-CR-119945] p0062 N71-36441
- ELECTROLYTES**
- High temperature fuel cell with thin disk solid electrolyte, evaluating performance as function of electrolyte, electrode and current collector resistance ratio
p0170 A70-42499
- Cubic stabilized zirconia utilization as solid electrolyte in high temperature fuel cell system for efficient and economical energy conversion
p0263 A72-33894
- High efficiency coal oxidation solid electrolyte fuel cell
[OCR-17] p0192 N68-12477
- Characteristics of protective effect of petroleum soluble corrosion inhibitors for iron in electrolyte hydrocarbon two-phase system
[AD-694781] p0258 N70-14391
- ELECTROLYTIC CELLS**
- Thermally regenerative energy conversion system using galvanic cells with electrochemically combined sodium and mercury streams to produce alloy and energy
p0129 A68-27639
- Secondary cells with liquid lithium anodes and immobilized fused salt electrolytes
p0262 A69-15330
- Cold hydrogen and basic electrolyte cells at CGE research center, discussing single cell batteries, reagent chambers and auxiliary control systems
p0115 A69-21039
- High temperature zirconium dioxide electrolyte fuel cell systems design and operation with methane or gasoline as fuel, evaluating performance characteristics
p0182 A73-15118
- ELECTROLYTIC POLARIZATION**
- Monograph on fuel cells covering thermodynamics, electrode polarization principles, electrocatalysis, system requirements, operational principles and applications
p0178 A72-24700
- ELECTROMAGNETIC FIELDS**
- One dimensional plasma flow variables relations analyzed in crossed electric and magnetic fields with small magnetic Reynolds numbers
p0126 A68-23796
- Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model
p0130 A68-29186
- Rumanian book on MHD covering electromagnetic field theory, motion equations, laminar flow, MHD generators, fluid motion past thin airfoils, shock waves, etc
p0157 A69-41363
- Magnetohydrodynamic induction generators with liquid metal working media, and electromagnetic field structures
p0194 N68-16287
- ELECTROMAGNETIC INTERACTIONS**
- Linear nonequilibrium shock tunnel driven supersonic MHD generator operation under large scale power extraction and strong electromagnetic-rare gas interactions
p0172 A71-29879
- ELECTROMAGNETIC PROPERTIES**
- Electrical parameters of synchronous MHD generator with pulsating electrical conductivity of incompressible fluid
[SM-74/210] p0211 N69-13333
- ELECTROMAGNETIC PUMPS**
- Numerical analysis method for performance prediction of linear induction machines including liquid metal MHD pumps and generators and linear motors
p0179 A72-29365
- Applicability of electrodynamic approximation in theory of liquid metal MHD energy converters
[SM-74/240] p0213 N69-13348
- ELECTROMAGNETIC RADIATION**
- Electromagnetic energy, examining solar energy conversion into electricity
p0025 A68-40644
- Thermal or chemical energy conversion to electromagnetic radiation by laser, discussing atomic or molecular processes and thermodynamic limitations
p0176 A71-38939
- ELECTROMAGNETISM**
- Electromagnetic processes in magnetohydrodynamic induction machines with working media of liquid metal
[NASA-TT-P-460] p0194 N68-16286
- Electromagnetic processes in conduction band of traveling magnetic field of flat inductor in magnetohydrodynamic machines
p0194 N68-16288
- ELECTROMAGNETS**
- Mechanical electromagnet model of MHD dynamo achieving direct conversion of mechanical to magnetic field energy
p0166 A70-28654
- Optimization of constant current electromagnet in MHD generator
[SM-74/83] p0210 N69-13317
- Development of superconducting magnet system for magnetohydrodynamic power generation
[AD-745321] p0249 N73-10247
- ELECTROMECHANICAL DEVICES**
- Book on electromechanical energy conversion devices covering voltage generation, torque production, components of control systems, dynamics and direct energy conversion
p0131 A68-31864
- Ac generators for converting mechanical to electrical energy for space power systems
p0228 N70-16224
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282] p0018 N72-13391
- Electromechanical energy conversion devices using both conventional and rare-earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168
- ELECTROMECHANICS**
- Traveling transverse magnetic field interaction with rigid conducting spheres or cylinders, discussing electromechanical characteristics and MHD energy conversion applications
p0129 A68-26140

ELECTRON BEAMS

- Pulsed power - A new technology for controlled thermonuclear fusion. p0181 A72-36332
- Plasma dynamics experiments related to controlled nuclear fusion p0209 N69-13069

ELECTRON CLOUDS

- Approximative solution for charge cloud growth in electrofluid dynamic generator p0216 N69-18445
- Electron screening effects on thermonuclear reactions under high densities [ITP-69-7] p0223 N69-34199

ELECTRON DENSITY (CONCENTRATION)

- Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties p0169 A70-40012

- Electrothermal instabilities effects on Brayton and Rankine cycle magnetohydrodynamic space power generation systems [NASA-TN-D-5461] p0224 N69-37883

- Nuclear seeded magnetohydrodynamic plasmas for electron kinetics using helium 3 [AD-690542] p0225 N69-39863

ELECTRON EMISSION

- MHD generator cathode current-sheath voltage characteristics for thermionic arc spot emission mode, noting role of cathode temperature [ASME PAPER 69-WA/HT-51] p0163 A70-14797

- Physical model for behavior of thermionic arc spots on MHD generator cathode [NASA-TN-D-54114] p0224 N69-35732

- Vacuum thermionic converter with short-circuited triodes and increased electron transmission and conversion efficiency [NASA-CASE-XLE-01015] p0225 N69-39898

- Basic converter physics and thermionic reactor design indicating role of electron energy loss reduction in converter [AD-699944] p0232 N70-26434

ELECTRON ENERGY

- MHD generator mounted at shock tube downstream used to obtain magnetically induced ionization, considering minimum initial equilibrium electron density p0126 A68-23120

- Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance p0144 A69-23463

- MHD conversion experiments using rare gas, considering Typhoe loop, electron heating and correction effects p0144 A69-23475

- Electron temperature instabilities in entrance region of magnetohydrodynamic generator [NASA-TN-X-1761] p0217 N69-20875

- Measurements of plasma parameters in simulated thermionic converter with cesium plasma for spacecraft use p0245 N72-10852

ELECTRON GAS

- Reversible thermodynamic cycle of chemical to electric energy conversion with electron gas as working body, discussing Gibbs-Helmholtz equations p0180 A72-32994

ELECTRON IMPACT

- Energy requirements for proton production by electron impact of hydrogen plasma [NASA-TN-X-52344] p0116 N68-24657

ELECTRON MOBILITY

- Effective conductivity in segmented electrode MHD generator with high electron temperature, using power law for electron collision frequency dependence p0120 A68-15642

ELECTRON-ION RECOMBINATION

- Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination p0027 A69-35679

- Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination p0039 A72-34264

ELECTRONIC EQUIPMENT

- Semiconductor solar thermoelectric generator allowing thermoelement replacement during service including construction, bridging methods and characteristics p0030 A70-10751

- Selected thermoelectric, thermionic, and electron-voltaic energy conversion device characteristics [SC-ARPC-1011] p0224 N69-38033

ELECTRONIC MODULES

- Reliability analysis of solar thermoelectric generator module as function of individual photocells, circuit design and redundancy p0036 A71-31672

- Solar cell generator technology development based on German AEROS satellite project and work on roll-up structure, discussing module concepts and test results p0042 A73-22439

- Fabrication methods for matrices of solar cell submodules [NASA-CASE-IMP-05821] p0060 N71-11056

ELECTROPLATING

- Thin film Cu-CdS solar cell electrochemical plating potential and solution composition effects on copper sulfide surface layer formation and cell efficiency p0038 A72-28008

ELECTROSTATIC CHARGE

- Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators [AGARDOGRAPH-122] p0215 N69-18439

- Characteristics and applications of electrofluid dynamic processes p0215 N69-18440

- Performance characteristics of electrofluid dynamic generators p0215 N69-18441

- Physical and theoretical aspects of viscous electrofluid dynamic energy conversion processes p0216 N69-18442

- Approximative solution for charge cloud growth in electrofluid dynamic generator p0216 N69-18445

- Hall converter for space charge neutralized electrofluid dynamic energy converter p0216 N69-18450

ELECTROSTATIC GENERATORS

- Book on direct energy conversion covering fuel cells, thermionic and thermoelectric systems, radiation cells, fusion plasma and other MHD generators p0132 A68-36891

ELECTROSTATIC PROBES

- Electrostatic probe measurement in flowing NaK seeded Ar closed cycle MHD generators p0132 A68-37310

- Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics [AFOSR-68-0859] p0202 N68-26537

EMISSION

- Natural gas and hydrogen-natural gas mixtures as automotive fuels and relationship of emissions to air-fuel ratio [TPR-48] p0099 N72-18761

- Emission data for groups conducting air pollution inventories [AP-42-REV] p0099 N72-19686

EMISSION SPECTRA

- Excitation and fluorescence spectra for identifying Navy fuel and fuel oils in sea water [AD-743703] p0102 N72-33736

EMITTERS

- Thermionic converter with chloride vapor deposited tungsten emitter and nickel collector [NASA-CR-14161] p0222 N69-32553

EMULSIONS

- Two phase MHD generator with gas in liquid metal emulsions, discussing loops efficiency p0147 A69-27479

ENCAPSULATING

- Improved efficiency of cadmium sulfide-copper sulfide thin film solar cells, noting optimization of layer formation, gridding and encapsulation p0038 A72-28016

ENDOTHERMIC REACTIONS

- Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0072 A68-45023
- Packed bed catalytic reactors cooling capacity in promoting endothermic reactions of hydrocarbon fuels, using computerized temperature and composition profiles
[AIAA PAPER 69-568] p0072 A69-33265
- Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0073 A71-24852

ENERGY

- Senate hearings on establishment of Commission on Fuels and Energy
p0096 W71-30165

ENERGY ABSORPTION

- Laser energy absorption by plasma for controlled thermonuclear fusion, comparing uses of electrically pumped gas, chemical and solid state lasers
p0187 A73-35379

ENERGY ABSORPTION FILMS

- Efficiency and performance limiting factors of single crystal and polycrystalline thin film cells
p0121 A68-17793

ENERGY CONVERSION

- Thermoelectric conversion of energy and radioisotope generators studied for selection criteria for power sources
p0119 A68-14136
- Design and performance of explosive driven magnetic generators, giving line drawings and current oscillograms
p0120 A68-15139
- Book on direct energy conversion covering photovoltaic conversion, thermoelectric generators, thermionic converters, radionuclide batteries and galvanic fuels, etc.
p0121 A68-17791
- Plasma heating by fast hydromagnetic wave, measurements of diamagnetic pressure determine efficiency for RF power conversion into thermal energy
p0122 A68-19482
- Chemical power conversion to mechanical or electrical energy noting relation to temperature limits of heat for heat engine
p0123 A68-20734
- Solar reflector mathematical model for studying interface between collector and heat receiver, noting error in cavity emitted radiation directional assumption
[AGARDOGRAPH 81] p0024 A68-22516
- Thermodynamics and design of open and closed cycle MHD energy conversion generators emphasizing end effects, Hall effects, heat transfer and aerodynamic losses
[AGARDOGRAPH 81] p0123 A68-22530
- Electrofluid dynamic energy conversion processes for direct power generation, discussing performance characteristics, working medium properties, etc.
[AGARDOGRAPH 81] p0124 A68-22534
- Performance characteristics of electrofluid dynamic energy conversion processes, using viscous coupling between neutral molecules and electrically charged particles
[AGARDOGRAPH 81] p0124 A68-22535
- Performance characteristics of electroballistic direct power generators
[AGARDOGRAPH 81] p0124 A68-22536
- Unipolar ions or charged colloids generation in high speed gaseous working media for electrofluid dynamic energy conversion, discussing corona discharge configurations
[AGARDOGRAPH 81] p0124 A68-22537
- Experimental techniques in electrofluid dynamic power generation, discussing energy transfer, ion generation, configuration effects, scaling characteristics and closed cycle operation
[AGARDOGRAPH 81] p0124 A68-22538
- Thermodynamic theory of irreversible processes in thermoelectric conversion, discussing Thomson and peltier effects and ideal generator
[AGARDOGRAPH 81] p0125 A68-22539

- High temperature thermoelectric materials limitations in energy conversion systems
[AGARDOGRAPH 81] p0125 A68-22540
- Bioelectrochemical energy conversion, discussing applications for toxic material identification, powering cardiac pacemakers and electric power generation
[AGARDOGRAPH 81] p0125 A68-22545
- Mechanical to electrical energy conversion of ferromagnetic, paramagnetic and diamagnetic materials by MHD converter and dielectric material by electrocaloric effect
p0128 A68-25934
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0131 A68-31227
- Si p-n junction for solar energy conversion, comparing electrical and spectral response characteristics for B and P diffused impurities
p0024 A68-31623
- Book on electromechanical energy conversion devices covering voltage generation, torque production, components of control systems, dynamics and direct energy conversion
p0131 A68-31864
- Book on direct energy conversion covering fuel cells, thermionic and thermoelectric systems, radiation cells, fusion plasma and other MHD generators
p0132 A68-36891
- Electromagnetic energy, examining solar energy conversion into electricity
p0025 A68-40694
- Materials limitations and problems for direct energy conversion methods of thermoelectricity, solar cells, thermionics and fuel cells
p0133 A68-41217
- Plasma expansion in uniform guide field and plasma flow kinetic energy conversion to thermal energy by shock wave due to magnetic barrier
p0134 A68-41790
- Book on MHD energy conversion covering conductivity, fluid mechanics, thermal and nonequilibrium ionization, Hall effect, aerospace applications, etc.
p0134 A68-42500
- Energy conversion - Conference, Boulder, August 1968
p0134 A68-42507
- Single cell batteries with low input voltage conversion regulation considered as long life energy storage system, noting circuit integration
p0138 A68-42571
- MHD power generation, commercial and space applications and potential thermal pollution reduction
p0138 A68-42581
- Direct energy conversion and materials limitations, discussing thermoelectricity, solar cells, thermionics and fuel cells
p0140 A69-11801
- Satellite power generation and transmission system for solar energy conversion, noting estimates of surface area and weight of collectors
p0026 A69-12296
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0140 A69-14153
- Closed loop magnetoplasmodynamic energy conversion system design, operation and duct section
p0145 A69-23483
- Laboratory device for investigating thermionic energy converters and measuring current-voltage characteristics by static/dynamic methods
p0156 A69-34700
- Energy conversion - Conference, Washington, D.C., September 1969
p0158 A69-42236
- Three phase DC-AC inverter with low harmonic distortion, good efficiency and packaging capability, stabilizing frequency by crystal controlled clock oscillator
p0162 A69-42294
- Thermionic emission characteristics of W and Mo subjected to focussed CW carbon dioxide laser radiation, discussing direct energy conversion
p0162 A70-12068

- Book on energy conversion statics covering state functions, quasi-static processes, internal energy, chemical energy storage and conversion, dynamics and postulates and laws
p0166 A70-27670
- Mechanical electromagnet model of MHD dynamo achieving direct conversion of mechanical to magnetic field energy
p0166 A70-28654
- Book on fuel cells electrochemistry covering direct energy conversion methods, electrode kinetics, electrocatalysis, organic substances, electrochemical combustion, research techniques, etc
p0166 A70-30100
- Biological conversion of solar energy, discussing photosynthesis and nonphotosynthesis mechanisms
p0032 A70-31600
- Axial pressure, electric current and potential distribution in two-phase particulate electroquasidynamic flow, discussing space charge electric field effect
p0170 A70-40257
- Book on direct energy conversion principles and methods covering fusion, fuel cells, MHD, thermoelectric, thermionic, photovoltaic, electrohydrodynamic, piezoelectric and ferroelectric power generation
p0171 A71-11193
- Electrofluid dynamic direct energy conversion, discussing working media, duct geometry, unipolar charges, and fluidic switches [ASME PAPER 70-ENER-A]
p0171 A71-13704
- Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle
p0171 A71-16785
- Soviet book on thermionic and MHD energy conversion covering gas ionization, converter operation and low temperature plasma physics
p0172 A71-26099
- Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth
p0035 A71-28665
- Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth
p0035 A71-28671
- Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystems
p0173 A71-30801
- Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle
p0174 A71-33037
- Bayesian decision theory, discussing choice of possible systems to convert wind into electrical energy
p0074 A71-33291
- Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources
p0174 A71-34227
- Hydrostatic power transmission systems classifications, considering transformation, transport and accumulation of energies /mass, heat, optical, chemical, pneumatic, hydraulic, etc/
p0257 A71-36202
- Combustion oscillator for MHD energy conversion, using products flow modulation by traveling pressure wave
p0175 A71-38099
- Energy conversion engineering - Conference, Boston, August 1971
p0175 A71-38901
- Electrical subsystem of 2-15 kW Brayton power conversion system consisting of speed controller, alternator voltage regulator, DC power supply, etc
p0175 A71-38910
- Thermal or chemical energy conversion to electromagnetic radiation by laser, discussing atomic or molecular processes and thermodynamic limitations
p0176 A71-38939
- Radioisotopes as energy source for power conversion systems, discussing future availability of fission products and transuranium elements from commercial nuclear power reactors
p0074 A71-38948
- Optimal conditions for energy conversion in MHD generator, observing ion seeding effect on plasma temperature
p0177 A72-11207
- Power supply and converters for satellite and spacecraft, discussing fuel cells, radioisotopes, nuclear reactors, etc
p0177 A72-16745
- Solar energy conversion as pollution-free power source, discussing silicon solar cells, power transmission techniques, satellite solar power stations and system control and guidance
p0037 A72-18625
- Kilowatt rotatory dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics
p0178 A72-21414
- Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties
p0037 A72-24315
- Cost efficiency and relative economic merits prediction for solar energy conversion systems
p0037 A72-24316
- Jet compression role in high temperature mechanical energy conversion heat exchanger based on ejector principle
p0179 A72-27724
- Radiovoltaic generator energy conversion by thin film solar cells, noting performance dependence on semiconductor band gap and radioisotope characteristics
p0038 A72-28021
- Reversible thermodynamic cycle of chemical to electric energy conversion with electron gas as working body, discussing Gibbs-Helmholtz equations
p0180 A72-32994
- Thermionic energy conversion with a Ba-Cs-diode.
p0180 A72-34603
- Large-scale concentration and conversion of solar energy.
p0039 A72-36075
- The impact of aerospace technology on energy conversion in the 70's.
[ASME PAPER 72-AERO-11]
p0008 A72-43147
- Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications.
[ASME PAPER 72-AERO-12]
p0181 A72-43148
- Laser energy conversion into electrical energy with photovoltaic cells, noting Si and GaAs cells power efficiencies improvement compared to operation in sunlight
p0040 A73-14210
- Synchronous satellite solar power station for solar energy conversion to microwaves for transmission to earth discussing technical, economic and social aspects
[ASME PAPER 72-WA/SOL-6]
p0042 A73-15801
- Analysis of optimal conditions for energy conversion in an MHD-generator channel
p0182 A73-16586
- German book - New energy systems for space flight.
p0183 A73-17668
- Satellite solar power station for solar energy conversion and transmission to earth via microwave beam, discussing technology status and weight and cost projections
p0042 A73-18027
- Electrical and isotope power from space for terrestrial use.
p0042 A73-18028
- Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations
p0183 A73-20396
- Intersociety Energy Conversion Engineering Conference, 7th, San Diego, Calif., September 25-29, 1972, Proceedings.
p0183 A73-22751

- Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams
p0043 A73-22791
- The Solar Collector Thermal Power System - Its potential and development status.
p0043 A73-22792
- Satellite solar power station systems engineering study, examining basic concept technical and economic feasibility
p0043 A73-22814
- Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829
- Radioisotopic energy conversion by radiovoltaic effect, describing titanium-tritium sources and semiconductor converter
p0185 A73-23278
- Near-equatorial synchronous orbit Satellite Solar Power Station system with photovoltaic cell arrays energy conversion into microwave power for transmission to earth
p0043 A73-23601
- Satellite electric power station for conversion of solar energy to microwaves beamed to earth, discussing structural design, flight control, transportation and technology assessment
p0044 A73-24554
- Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volumes 1 & 2.
p0185 A73-25976
- Principles of photovoltaic solar energy conversion.
p0044 A73-29591
- The feasibility of a satellite solar power station.
p0045 A73-32718
- Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum.
p0188 A73-38386
- A solar engine using the thermal expansion of metals.
p0046 A73-38473
- Russian book - Physical bases of thermionic energy conversion.
p0190 A73-41876
- Colloquium on energy sources and energy conversion [AGARDGRAPH-81]
p0195 N68-17793
- Reactor shielding, reactor fuel temperatures, and radioisotope sources for dynamic energy conversion systems
p0195 N68-17794
- Radiator design criteria for dynamic converters in which working fluids are condensed directly in radiator tubes
p0195 N68-17796
- Heat transfer limitations in dynamic energy conversion systems for space power plants
p0195 N68-17797
- Thermal energy storage by utilizing heats of fusion for suitable materials
p0263 N68-17798
- Rankine cycle low power turbocompressor for space applications
p0196 N68-17799
- Nuclear source limitations for direct conversion systems
p0196 N68-17803
- Limitations of solar collectors and receivers for space applications
p0047 N68-17804
- Thermodynamic properties of thermionic emitters, electron collectors, and ionization and excitation of gas in interelectrode spaces of thermionic energy converters
p0196 N68-17805
- Energy conversion in vapors ionized by fission products
p0196 N68-17808
- Plasma diagnostics in energy conversion
p0196 N68-17809
- Open and closed cycle magnetohydrodynamic generators for energy conversion systems
p0197 N68-17810
- Nonequilibrium modes of operation for magnetohydrodynamic energy converters
p0197 N68-17811
- Nonequilibrium electron mode for kilowatt range magnetoplasma dynamic generation of space power
p0197 N68-17812
- Generalized Saha equation for nonequilibrium two temperature plasmas
p0197 N68-17813
- Direct electrofluid dynamic energy conversion for space power applications
p0197 N68-17814
- Electrofluid dynamic energy conversion processes using viscous coupling between neutral molecules and electrically charged particles
p0198 N68-17815
- Performance characteristics of electro-ballistic generators for fluid dynamic energy into electric energy
p0198 N68-17816
- Ion generation by corona discharge in electrofluid dynamic energy conversion
p0198 N68-17817
- Experimental equipment and testing methods for electrofluid dynamic energy conversion
p0198 N68-17818
- Thermodynamic theory of irreversible processes applied to thermoelectric energy conversion
p0198 N68-17819
- High temperature material limitations in thermoelectric energy conversion
p0198 N68-17820
- Reactant properties of fuel cells used as chemical energy converters
p0198 N68-17821
- Catalysis in electrochemical energy conversion
p0199 N68-17823
- Oxygen electrode kinetic factors in fuel cell energy conversion processes
p0199 N68-17824
- Electrothermal and thermal modes of regeneration in fuel cells for space power applications
p0199 N68-17825
- State-of-the-art review on thermodynamics and applications of bioelectrochemical energy conversion processes
p0199 N68-17826
- Photovoltaic efficiency of photodiodes in solar cells
p0199 N68-17828
- Conversion efficiency of photovoltaic cells for converting luminous into electrical energy
p0199 N68-17829
- P-i-n structure for controlled spectrum photovoltaic conversion of radiant to electric energy
p0199 N68-17830
- Materials, plasma, and electrochemical research on unconventional energy conversion techniques [NASA-CR-93979]
p0010 N68-21035
- Energy conversion research [AFCHL-67-0512]
p0200 N68-21051
- Design and construction of ARGAS experimental magnetohydrodynamic generator at nuclear research facility Juelich, Germany [JUL-510-TP]
p0201 N68-21331
- General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power [PTD-MT-64-355]
p0203 N68-26786
- Performance of expandable whirling membrane solar energy concentrator for space power conversion [NASA-TN-X-59872]
p0049 N68-27564
- Conference proceedings on performance predictions and technological developments for static energy conversion devices for space missions [AGARD-CP-21]
p0203 N68-28714
- Optimum design of spacecraft power supply systems using fuel cells, and characteristics of energy conversion methods
p0203 N68-28738
- Eight static and dynamic energy conversion systems for spacecraft power sources for future missions
p0203 N68-28748
- Dc or low frequency ac conversion of microwave power into electrical power [REP-4]
p0205 N68-30681
- High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters [NASA-TT-F-11825]
p0205 N68-30811

Thermal diffusion of materials, magnetoplasma studies, and electrochemical processes for purpose of energy conversion by unconventional techniques
[NASA-CR-97473] p0207 N69-10111

Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics
[AD-674611] p0012 N69-13314

Applicability of electrodynamic approximation in theory of liquid metal MHD energy converters
[SM-74/240] p0213 N69-13348

Economic analysis of balanced energy conversion and storage systems with application to conventional and nuclear power plants
p0264 N69-15054

Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators
[AGARDGRAPH-122] p0215 N69-18439

Characteristics and applications of electrofluid dynamic processes
p0215 N69-18440

Research on electrofluid dynamic energy conversion in Belgium
p0216 N69-18446

Ion adsorption mechanism and electrochemical energy conversion on fuel cell electrode
[NASA-CR-100892] p0219 N69-25396

References on magnetohydrodynamic generators
[AD-686000] p0222 N69-32347

Thermoelectric, thermionic, and Brayton conversion devices for radioisotopic power generators
[AD-687131] p0223 N69-32804

Materials, plasma, and electrochemical engineering for energy conversion
[NASA-CR-103989] p0223 N69-34810

Magnetic systems using steel for magnetohydrodynamic generators
[AD-688393] p0224 N69-35280

Liquid metal magnetohydrodynamic energy conversion cycles for spacecraft supply
[NASA-TM-X-63671] p0224 N69-37703

Selected thermoelectric, thermionic, and electron-voltaic energy conversion device characteristics
[SC-ARFIC-1011] p0224 N69-38033

Electrical isotopic generator in milliwatt range
[CEA-R-3834] p0225 N69-40586

Solar, chemical, and nuclear energy as space power system primary energy sources
p0056 N70-11303

Lecture series on energy conversion and systems engineering for space power sources
[AGARDGRAPH-123-PT-1] p0228 N70-16217

Mechanical heat engines as energy conversion devices for space power generation
p0228 N70-16221

AC generators for converting mechanical to electrical energy for space power systems
p0228 N70-16224

Thermionic converter development status from viewpoint of prospective engineering use
p0229 N70-16226

Electrochemical energy storage and electricity generation for space power sources
p0229 N70-16227

Optimal systems for storage of solar energy after thermal conversion
p0056 N70-16229

Fuel cells and storage batteries for different types of energy conversion
[AD-696428] p0230 N70-21253

Magnetohydrodynamic problems in transformation of energy
[AD-699661] p0231 N70-25577

Conceptual designs for radioisotope electric power system
[ORNL-TM-2366] p0233 N70-29364

Efficiency of power production in MHD generators with nonequilibrium plasmas
[IAE-1701] p0235 N70-33216

Developing magnetohydrodynamic generators for production of electrical energy
p0236 N70-36136

Developing magnetohydrodynamic generators for production of electrical energy
p0236 N70-36137

Thermoelectric power conversion by liquid metal flowing through magnetic field
[NASA-CASE-XNP-00644] p0236 N70-36803

Installations for direct conversion of heat into electrical energy by MHD generators and other energy devices
p0236 N70-37070

Energy conversion and electric power plants for developing countries
p0093 N70-38878

Direct conversion of fusion power to electricity and reduction of waste heat in reactors
[TID-25414] p0237 N70-39141

Concentrator device for controlling direction of solar energy onto energy converters
[NASA-CASE-XLE-01716] p0059 N70-40234

Abstracts of conference papers on kinetics of energy conversion
[AD-712738] p0238 N71-12372

Describing general characteristics of system for direct conversion of thermal into electrical energy by thermodynamic analysis
p0239 N71-13249

Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736

Thermodynamic characteristics of electrochemical energy conversion into electrical energy
[AD-713875] p0240 N71-16314

MHD energy conversion using Joule heating
[AD-720257] p0241 N71-26190

Experimental and computational investigations of direct conversion of plasma energy to electricity
[CONF-710607-126] p0244 N71-38463

Analysis of problems created by energy production and consumption in highly developed countries
[ORNL-NSF-EP-3] p0017 N72-11848

Physical processes underlying solar-energy conversion through photovoltaic effect
p0064 N72-27057

Japanese research and development progress in energy conversion and chemical propulsion
[AD-739325] p0248 N72-27067

Photoelectric, thermoelectric, and thermoemission methods of converting solar to electrical energy
[AD-747293] p0065 N73-11050

Research on closed cycle MHD power generation for converting heat into electricity
[RT/ING-(71)20] p0250 N73-12784

Conversion and utilization of solar energy to solve energy shortages and pollution problems on earth
p0066 N73-13866

Conversion of solar energy to pollution free power
p0019 N73-13870

Development of surfaces and coatings for solar energy conversion systems
[NASA-TT-F-14650] p0066 N73-15598

Electromechanical energy conversion devices using both conventional and rare-earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168

Applications of solar energy to heat and power requirements
[NASA-CR-133101] p0068 N73-26818

Techniques for improving performance of gallium arsenide solar cells by ion implantation
[NASA-CR-135510] p0068 N73-30977

Device for converting electromagnetic wave energy into electric power
[NASA-CASE-GSC-11394-1] p0254 N73-32109

Heliothermic conversion of solar radiation for industrial use
p0069 N73-33767

ENERGY CONVERSION EFFICIENCY

Thermoelectric converters for direct thermal to electric energy conversion, citing SNAP isotopic generator space power systems
p0119 A68-11240

Infinitely segmented electrode thermoelectric direct energy conversion device performance and characteristics
p0119 A68-11941

Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0023 A68-18449

Thin film solar cell materials, fabrication, structure and properties related to energy conversion efficiency in space applications
p0024 A68-20738

- Efficiency limitations of solar energy collectors and receivers as converters in space applications [AGARDOGRAPH 81] p0024 A68-22525
- Photodiode efficiency in photovoltaic generators, investigating series resistance influence and means of improving cell performance [AGARDOGRAPH 81] p0125 A68-22547
- Photovoltaic cell geometrical and electrical parameters analysis, considering conversion efficiency and spectral adaptation [AGARDOGRAPH 81] p0125 A68-22548
- Edge irradiated p-i-n structure for use with high intensity controlled spectrum photovoltaic converters, considering output, series resistance and collection efficiencies [AGARDOGRAPH 81] p0126 A68-22549
- One wave induction MHD converter performance advantages over uncompensated multiwave converter balanced by friction losses and inductive power requirements p0128 A68-23932
- Chemically regenerative fuel cells, discussing competitiveness with direct fuel cells p0129 A68-27650
- Molecular chemistry, statistical mechanics and plasma physics principles for theoretical output current and efficiency characteristics of vapor thermionic converters p0130 A68-29729
- Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization p0131 A68-31228
- Thermoelectric converters efficiency as function of Si photocells optical characteristics p0025 A68-39356
- Traveling wave MHD induction generator with variable fluid velocity having rotating machine internal electrical efficiency [JPL-TR-32-1328] p0133 A68-39723
- Closed-loop cycle converter, composed of MHD generator and compressor consuming thermal energy, exhibiting moderate cycle efficiency decreases p0134 A68-41272
- Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion p0138 A68-42954
- Solar energy storage optimization for satellite and space vehicle power systems, discussing thermal collection in heat sinks and electric batteries p0261 A68-43812
- Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization p0140 A69-14154
- Thermionic energy converter theory and efficiency, discussing design considerations to improve performance p0142 A69-18255
- Optical motor system to efficiently convert laser energy into mechanical rotational energy, giving equations for controlling motor speed p0142 A69-22457
- Constant and traveling magnetic fields MHD converters induction and finite dimensions influence analyzed by conformal mapping, separation, Fourier and finite difference methods p0147 A69-25399
- Energy conversion with liquid metal working fluids in MHD generators, discussing single stage fully Carnotized process p0147 A69-27482
- Liquid metal two phase flow MHD generators efficiency prediction, discussing end losses and flow velocity p0148 A69-27485
- Optimal cycle parameters for liquid metal single component MHD cycle, employing condensing ejector in front of generator p0148 A69-27488
- Liquid metal MHD generator cycles thermodynamic analysis, considering multicycle operation improvement with heat regeneration p0148 A69-27489
- Liquid-metal MHD space power generation system using intermittent vaporization slugs shooting at 2700 R peak temperature p0149 A69-27492
- Liquid metal MHD induction generators design and performance, considering effect of geometry, operating conditions, fluid properties and power level on efficiency p0150 A69-27503
- Liquid metal induction MHD generator I-V characteristics at no load permitting self excitation with capacitors p0151 A69-27509
- Induction, helical and straight through liquid metal MHD generators tested under independent and self excitation conditions p0151 A69-27512
- Three phase high temperature liquid metal induction MHD generator performance, noting velocity profile nonuniformity influence p0151 A69-27513
- SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times p0155 A69-29191
- Soviet research on thermionic energy conversion, advantages and applicability in various fields p0156 A69-29279
- Radioisotope thermoelectric generators /RTG/ design and performance analysis method applied to generators using Si-Ge Air-Vac type thermocouples p0161 A69-42260
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc p0028 A69-42271
- Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect p0162 A70-10754
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc p0031 A70-15329
- Solar cell for improved performance during extreme temperature fluctuations, discussing wraparound contact p0031 A70-16724
- Electrical effects of boundary layers on insulator wall of MHD generator, considering equilibrium and nonequilibrium ionization generators performance p0164 A70-19321
- Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage p0164 A70-21274
- GaAs solar cells performance as function of doping levels, ascribing poor efficiencies to surface recombinations p0032 A70-21721
- Electrodynamic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures p0165 A70-27330
- MHD induction generator efficiency, investigating winding slot finite spacing and width effects p0166 A70-30531
- BGD energy converter system geometries for maximum power efficiencies, comparing slender conversion channels, abrupt expansion, free jet and divergent for operating characteristics p0167 A70-30536
- Solar thermoelectric generator /STEG/ with two stage converter, discussing weight factors and efficiency p0032 A70-32425
- Cadmium telluride photocells, discussing performance and mass production p0167 A70-38481

- Plasma inhomogeneities effects on MHD generators
I-V characteristics, energy conversion
efficiency and optimum duct geometry
p0167 A70-39636
- Collection efficiency and spectral response
calculations for semiconductor heterojunction
solar cells
p0033 A70-40623
- Electrodynamic generator with spatial charge
neutralization for direct thermal-to-electrical
energy conversion at high gas pressures
p0170 A70-42071
- Transverse current leakage effect on energy
conversion and Hall characteristics of MHD
generator
p0171 A71-12195
- Si solar cells low temperature and solar intensity
performance optimization by identifying and
eliminating low output problems
p0034 A71-16071
- Si solar cells with high electrical output in
space sunlight, discussing device limitations
p0034 A71-16102
- Si solar cell technology, discussing contacts, low
temperature performance and conversion efficiency
p0034 A71-16103
- Power loss processes in Si solar cells, noting
improvement in collection, voltage and curve
factors
p0035 A71-16104
- High efficiency and power long life cross field
amplifier generator for solar energy conversion
in space into microwave, discussing magnetron
and amplatron
p0035 A71-28668
- High power linear beam tube devices for space
power generation station, considering use of
klystron with heat pipes for low weight and high
efficiency
p0035 A71-28669
- Energy conversion efficiency improvement of
silicon solar cells, noting power loss effects
p0036 A71-29702
- Electrode size effects on voltage loss and
boundary layer conductivity of combustion driven
MHD generator
p0173 A71-29880
- Electrically-heated Brayton power conversion
system, comparing performance tests with
prediction
p0173 A71-32212
- Test facility and performance predictions for
Rankine cycle power system components, including
lithium heater, potassium boiler, condenser and
preheater
[GRSP-451]
p0173 A71-32223
- Photoeffect efficiency of solar energy converters
based on semiconductor cadmium sulfide-copper
sulfide heterojunctions
p0036 A71-42536
- Solar to electric energy conversion efficiency and
electrical properties of photoconverters using
compressed sintered CdS
p0036 A71-44390
- High efficiency solar electricity converters
utilizing wave-like properties of radiation
interacting with absorber-converter elements,
discussing cost and fabrication advantages
[ASME PAPER 71-WA/SOL-1]
p0036 A72-15891
- Solar cells with improved photoelectric
efficiency, describing use of noncorroding
Ti-Pd-Ag contacts, titanium oxide antireflection
layer and welded cell joints
p0037 A72-17751
- Thin film Cu-CdS solar cell electrochemical
plating potential and solution composition
effects on copper sulfide surface layer
formation and cell efficiency
p0038 A72-28008
- Improved efficiency of cadmium sulfide-copper
sulfide thin film solar cells, noting
optimization of layer formation, gridding and
encapsulation
p0038 A72-28016
- High electric power output Si solar cell
development, discussing increased energy
conversion efficiency
p0038 A72-28026
- Si solar cell efficiency in synchronous orbit
radiation field increase via improvement in
diffusion profile, low resistivity material and
diode characteristics
p0039 A72-32131
- Cubic stabilized zirconia utilization as solid
electrolyte in high temperature fuel cell system
for efficient and economical energy conversion
p0263 A72-33894
- Thermionic converters efficiency in commercial
power generation applications, considering
lifetime, reliability and cost
p0181 A72-36192
- Superconducting magnet ac generators development,
emphasizing conversion efficiency,
manufacturing, relative costs, machine geometry
and interwinding coupling factor effects
p0182 A73-11833
- Secondary ionization and its possible bearing on
the performance of a solar cell.
p0040 A73-12048
- Silicon violet solar cell energy conversion
efficiency improvement through extended spectral
response and increased fill factor
p0040 A73-14212
- High efficiency Cu₂S-CdS-solar cells with improved
thermal stability.
p0041 A73-14216
- Investigations of the inhomogeneity of
polycrystalline Cu_x/S-CdS solar cells.
p0041 A73-14222
- Linear solar collector conversion efficiency over
wide operating temperature range via model
consisting of long pipe with energy injection at
points along length
[ASME PAPER 72-WA/SOL-7]
p0042 A73-15802
- Solar cells with Si Schottky function diode,
discussing fabrication and barrier metal and
thickness effects on output power and energy
conversion efficiency
p0042 A73-16816
- Fuel cells for improved electrical power supply.
[AIAA PAPER 73-82]
p0183 A73-17641
- A system for the evaluation of solar cell
cell samples.
p0042 A73-22438
- Spacecraft dynamic solar electric power/thermal
control system with cold liquid flow and
regenerator cooling for energy conversion
efficiency and weight characteristics improvements
p0043 A73-22785
- Laser energy transfer - An analytic survey of high
power applications.
p0257 A73-22822
- A model of a thermophotovoltaic radionuclide
battery.
p0185 A73-23279
- Radiophotovoltaic devices power and energy
conversion efficiency limits, investigating
phosphors deterioration and nuclide layer
optimal thickness
p0185 A73-23280
- Theoretical possibility of converting the kinetic
energy of an ionized gas flow into electricity
p0185 A73-23473
- Evaluation testing of a closed Brayton-cycle
electrical-power-conversion system.
p0185 A73-25983
- Concept for a high voltage solar array with
integral power conditioning.
p0044 A73-26001
- Qualitative analysis of MHD energy conversion
efficiency
p0186 A73-27321
- Historical development of solar cells.
p0044 A73-29590
- Solar array cost reductions.
p0044 A73-29592
- Research plans for solar power in space.
p0044 A73-29594
- Solar energy conversion development relative to
Department of Defense space power requirements.
p0044 A73-29595
- CdTe thin film fabrication by direct synthesis of
vacuum evaporated Cd and Te, noting solar cell
efficiency increase after storage in room
temperature exsiccator
p0045 A73-30475

SUBJECT INDEX

ENERGY DISSIPATION

Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass envelope improvement
[AIAA PAPER 73-710] p0045 A73-36331

An analysis of linear focused collectors for solar power.
p0046 A73-38409

Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411

Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range.
p0189 A73-38414

Multihundred watt radioisotope thermoelectric generator design for on-pad and orbital conditions, discussing configurations, Pu-238 heat source and operating characteristics
p0189 A73-38419

Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection
p0189 A73-38422

Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion.
p0190 A73-41676

Hydrazine and methanol fuel cells comparison with hydrogen-air cells in terms of fuel costs and conversion efficiency, considering electric generators and automotive applications
p0116 A73-45025

Explosive devices for converting explosive energy into magnetic fields for direct power generators
[UCRL-TRANS-10133] p0192 N68-14541

Thermomagnetic and thermoelectric effects used to improve energy conversion efficiency of thermodynamic cycles
[DGLR-68-0051] p0201 N68-22013

Energy conversion efficiency of thermal and electric regenerative fuel cells
p0203 N68-28735

Technology for fabricating cadmium telluride solar photoelectric cells with improved energy conversion efficiency
p0050 N68-28744

Germanium solar photoelectric cells for high intensity solar energy conversion devices
p0050 N68-28746

Developing and improving energy conversion efficiency, electrification, and electric power transmission in U.S.S.R.
[M-7428] p0011 N68-35752

Thermodynamics of two component liquid metal MHD power plant with vapor-liquid injector
[SH-74/218] p0212 N69-13335

Problems in operating MHD generator installation
[SN-74/221] p0212 N69-13336

Determining dimensions of MHD channel
[SN-74/242] p0213 N69-13350

Vacuum thermionic converter with short-circuited triodes and increased electron transmission and conversion efficiency
[NASA-CASE-XLE-01015] p0225 N69-39898

Space power systems lectures on sources and requirements
[ESRO-SP-45] p0226 N70-11301

Isotopic energy sources for space applications
p0226 N70-11304

Nuclear reactors for electric power sources in space applications
p0226 N70-11305

Solar cell efficiencies computed for semiconductor heterojunction cells
[NASA-CR-49827] p0056 N70-12119

Basic converter physics and thermionic reactor design indicating role of electron energy loss reduction in converter
[AD-699944] p0232 N70-26434

Description and evaluation of digital computer program for analysis of Lundell alternators
[NASA-TN-D-5814] p0233 N70-28433

Photovoltaic solar energy conversion
p0058 N70-30228

Performance of actual solar cells compared with theoretical predictions
p0058 N70-30229

Direct conversion of thermal energy into electrical energy using crossed electric and magnetic fields
[NASA-CASE-XLE-00212] p0235 N70-34134

Investigating technology for developing organic Rankine cycle power conversion system for space operation
[SAN-651-118] p0237 N70-37652

Design and testing of lithium fluoride cavity receivers for solar power conversion systems
[NASA-CR-54752] p0237 N70-42202

Investigating relationship of conversion efficiency to fixed and variable costs in fusion reactors
[UCRL-72349] p0239 N71-15242

Analysis and breadboarded performance of parallel energy storage units for power systems
[NASA-CR-116510] p0266 N71-17471

Flight testing of cadmium sulfide thin film solar cells for stability and efficiency
[AD-723315] p0062 N71-31939

Research and development on silicon solar cell with improved efficiency
[NASA-CR-121751] p0062 N71-34042

Efficiency of electric power production on MHD generators in nonequilibrium plasma
[AD-724973] p0245 N72-10782

Technical feasibility of improving efficiency of solar cells for space programs
[NASA-CR-127234] p0064 N72-27055

Considerations, conclusions, and recommendations for improving efficiency of solar cells
p0064 N72-27056

Maximum efficiency of solar energy conversion for photovoltaic cells
p0248 N72-27058

Analysis of loss mechanisms in silicon solar cells and their impact on conversion efficiency
p0064 N72-27059

Efficiency and thermal losses of radioisotope thermoelectric generator
[PRNC-CONF-13] p0248 N72-28731

Feasibility of using photovoltaic cells to convert laser energy into electrical energy
[LA-DC-72-468] p0065 N73-12061

Gas turbine power plants in future urban energy planning
[RE-439J] p0253 N73-22912

Solar heating and air conditioning as energy conservation alternatives to nuclear power
[NASA-TN-X-70468] p0022 N73-31990

Characteristics of hydrazine-oxygen fuel cell operating under moderate temperature conditions and various power density concentrations
[AD-764930] p0255 N73-33009

ENERGY DISSIPATION

Thermodynamics and design of open and closed cycle MHD energy conversion generators emphasizing end effects, Hall effects, heat transfer and aerodynamic losses
[AGARDOGRAPH 81] p0123 A68-22530

Linear inductive MHD converters, reducing effects of losses due to finite length of converter by cylindrical construction
p0150 A69-27505

Thermal contacts effects on optimum operating conditions of solar thermoelectric power generator, discussing losses due to low thermal conductivity coefficient of insulating layers
p0027 A69-32797

Heat losses in oil wells hot liquid injections, modifying Groveanu approximation method for exact solution
p0074 A72-15743

Fringing losses and efficiency of finite length magnetohydrodynamic traveling wave cylindrical accelerator or generator
p0204 N68-30018

Mirror systems in fuel cycles, loss reduction, and energy recovery
[UCRL-71753] p0092 N70-28899

Development of relationship between consumption of energy by technological processes and second law of thermodynamics
[NASA-TN-X-65912] p0019 N72-26971

Analysis of loss mechanisms in silicon solar cells and their impact on conversion efficiency
p0064 N72-27059

ENERGY DISTRIBUTION

SUBJECT INDEX

- Efficiency and thermal losses of radioisotope thermoelectric generator
[FPMC-CONF-13] p0248 N72-28731
- ENERGY DISTRIBUTION**
- Solar radiant energy distribution pattern and temperature in focus of parabolic cylinder concentrator constructed of plane mirror elements
p0025 A68-41092
- Computation and optimization of energy distribution over randomly oriented elements of radiation receiving surface of hollow collector of concentrator type solar device
p0026 A69-22534
- Solar power concentrator-absorber system, discussing flux distribution in focal plane and cavity heater optimization
p0027 A69-33795
- Direct solar radiation concentration by paraboloid mirrors, analyzing energy transport and distribution functions, based on statistically distributed imperfections of reflecting surfaces
p0030 A70-10762
- Absorber positioning inaccuracy influence in concentrating solar unit mirror on unit energy parameters, discussing defocusing
p0030 A70-10763
- A universal power characteristic of a high-temperature solar heat source
p0039 A72-35516
- Long term assessment of global and regional energy demands
[A/CONF-49/P/420] p0018 N72-16982
- Energy requirements of Department of Defense and identification of research and development activities
[AD-754824] p0106 N73-20819
- ENERGY LEVELS**
- Development of relationship between consumption of energy by technological processes and second law of thermodynamics
[NASA-TN-X-65912] p0019 N72-26971
- ENERGY POLICY**
- Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity
p0022 N73-33928
- ENERGY REQUIREMENTS**
- Minimal energy stochastic controller design for electrically driven vehicles, using dynamic programming
p0177 A72-17304
- The utilization of solar energy to help meet our nation's energy needs.
p0045 A73-32193
- Minimum required energies for direct initiation of gaseous detonation waves in acetylene-oxygen mixtures
[BM-RI-7061] p0116 N68-12434
- Energy requirements for proton production by electron impact of hydrogen plasma
[NASA-TN-X-52344] p0116 N68-24657
- Projected future world energy requirements, resources, and need for breeder and fusion reactors
[REPT-69-11] p0013 N69-35574
- Review and comparison of energy forecasts for United States of America
[PB-189938] p0015 N70-37343
- Electrical power distribution system and energy consumption during long duration operation of space station simulator
p0258 N71-20975
- Factors relevant to development of fuels and energy policies compatible with environmental control
p0016 N71-29471
- Management planning in Sweden for natural gas as industrial energy source
[IVA-MEDD-167] p0096 N71-30522
- Effect of energy demands on ecology and efforts to preserve environment from degradation and contamination
[BNL-16228] p0018 N72-20371
- Signed digraphs for forecasting energy demands and analyzing policies for meeting environmental constraints on energy use
[R-756-NSF] p0018 N72-20948
- Energy used in intercity freight transportation by water, rail, pipeline, truck, and air, and effect of fuel price increases
[R-804-NSF] p0258 N72-23979
- Hearings concerning research and development requirements for future energy needs
p0019 N73-10980
- Congressional hearings concerning critical energy needs
p0020 N73-17989
- Congressional study on historical background of energy research and development
p0021 N73-22928
- Hearings concerning energy problems of US
p0021 N73-23969
- Review of resources of fossil and nuclear fuels, solar energy and hydroelectric power
[LRP-63/73] p0021 N73-30975
- Use of energy in transportation and implications for future
[P-5025] p0113 N73-33921
- ENERGY SOURCES**
- Energy source, power conversion, heat rejection and power conditioning and distribution subsystems constituting secondary power conversion systems
p0129 A68-29145
- Solar cells for onboard spacecraft energy supply, discussing design, operation and power output of various cells
p0024 A68-33039
- Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941
- Cadmium sulfide thin film solar cell design for space applications
p0025 A68-42518
- Book on fuel cells and fuel batteries covering thermodynamics, electrocatalysis, overvoltage, Gemini spacecraft battery, etc
p0139 A68-44312
- Astronautics - Conference, Braunschweig, West Germany, October 1968, Volume 2, Energy sources
p0147 A69-25862
- Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons
p0027 A69-31287
- Book on batteries and energy systems covering theoretical concepts, construction, operation principles, characteristics and applications of various types of primary and secondary cells
p0262 A70-42454
- Gas tight lead storage battery with negative plates for oxygen absorption
p0262 A70-46352
- Radioisotopes as energy source for power conversion systems, discussing future availability of fission products and transuranium elements from commercial nuclear power reactors
p0074 A71-38948
- Power generation for electrical, thermal and transportation needs, considering technology use for air, noise, thermal, water and nuclear pollution reduction
p0037 A72-18627
- Liquid or solid propellant hot gas turbines as power source for hydraulic and electrical energy
p0181 A72-36558
- Cost goals for silicon solar arrays for large scale terrestrial applications.
p0041 A73-14250
- Geothermal energy extraction from hot rocks via deep dry wells by pressurized water circulation, solving numerically fluid flow, heat transport and rock fracture equations
p0075 A73-16382
- German book - New energy systems for space flight.
p0183 A73-17668
- Thermoelectric radioisotope generators and nuclear thermoelectronic reactors, noting anaerobic self contained reliable operation and suitability for underwater energy sources
p0183 A73-22203

- The phosphoric acid fuel cell, a long life power source for the low to medium wattage range.
p0184 A73-22821
- Some major terrestrial applications of solar energy.
p0045 A73-35312
- Available energy sources and sources of future including nuclear fusion and fission
[LA-DC-9519] p0010 N68-28181
- Alternative power sources as replacements for mercury cells
[AD-675936] p0264 N69-11907
- Properties and limitations of chemical and nuclear fuels in aircraft engines
[AD-685535] p0116 N69-29919
- Projected future world energy requirements, resources, and need for breeder and fusion reactors
[REPT-69-11] p0013 N69-35574
- Mixed fission products potential as thermal and gamma energy sources
[BNWL-1115] p0224 N69-38506
- Energy sources in US to achieve future electric energy needs and environmental compatibility requirements
p0095 N71-29852
- Development and distribution of natural resources to satisfy energy requirements of US industry during the 1970's
[BN-IC-8526] p0096 N71-36393
- Analysis of problems created by energy production and consumption in highly developed countries
[ORNL-NSF-EP-3] p0017 N72-11848
- Long term assessment of global and regional energy demands
[A/CONF-49/P/420] p0018 N72-16982
- Generation, transmission, and utilization of energy in United States of America
p0018 N72-23948
- Briefings on energy sources, resources, and research
p0018 N72-25929
- Method for technical evaluation of controlled nuclear fusion for energy production
[NP-19152] p0019 N73-12707
- Nuclear energy in hydrogen production by water dissociation method
[EUR-4838] p0020 N73-15699
- Physical and chemical energy sources for earth, sea, and space
[AD-753828] p0020 N73-18093
- Interrelationships between energy, resources, and environment, conference summary
[PB-213031] p0020 N73-20820
- Analysis of methods for meeting national energy requirements with emphasis on technology for using solar energy
[NASA-TM-X-68230] p0067 N73-22748
- Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2
[EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368
- Solar energy, thermonuclear energy, and fossil fuel energy sources
[UCRL-74697] p0022 N73-33005
- Hydrogen and other synthetic fuels
[TID-26136] p0118 N73-33738
- ENERGY STORAGE**
- One megajoule inductive energy storage system using water cooled air core coil with optimum shape
p0261 A68-23903
- Thermal cells stressing lithium anode cells with various cathodes in eutectic electrolyte, discussing inorganic separators compatibility
p0261 A68-42515
- Single cell batteries with low input voltage conversion regulation considered as long life energy storage system, noting circuit integration
p0138 A68-42571
- Solar energy absorbers and thermal storage devices for high temperature energy conversion to electric power by thermionic or thermoelectric method
p0030 A70-10764
- Book on energy conversion statics covering state functions, quasi-static processes, internal energy, chemical energy storage and conversion, dynamics and postulates and laws
p0166 A70-27670
- Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources
p0174 A71-34227
- Hydrostatic power transmission systems classifications, considering transformation, transport and accumulation of energies /mass, heat, optical, chemical, pneumatic, hydraulic, etc/
p0257 A71-36202
- Coaxial plasma source energetic characteristics, establishing plasmod energy linear dependence on battery stored energy
p0115 A72-26754
- High strength straight filament superflywheel configurations with improved energy storage capability for vehicle, tool and power supply applications
p0263 A73-14744
- Large-scale applications of superconducting coils.
p0183 A73-20107
- Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations
p0183 A73-20396
- Mechanical energy storage by flywheel with magnetic fluid hermetic seal and bearing, using anisotropic and whisker materials
p0263 A73-25979
- A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.
p0186 A73-25984
- Analysis of the parameters of solar-heat power sources with energy storage units
p0045 A73-34283
- Energy storage possibilities of superconductors, and use of dielectric materials
[CEA-R-3243] p0263 N68-15938
- Theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics
[DAPL-31] p0207 N68-37342
- Systems analysis of modular energy storage unit for improved reliability of battery power system
p0264 N69-12431
- Economic analysis of balanced energy conversion and storage systems with application to conventional and nuclear power plants
p0264 N69-15054
- Switching mechanism with energy stored in coil spring
[NASA-CASE-XGS-00473] p0265 N70-38713
- Energy storage in superconducting short solenoid of circular cross sections
[LA-TR-70-9] p0265 N71-11913
- Energy storage and release capabilities of superconductors at high power
[NASA-TT-F-13585] p0266 N71-23515
- Application of isotensoid flywheels to spacecraft energy and angular momentum storage
[NASA-CR-1971] p0266 N72-17020
- Inductive magnetic energy storage with superconductors or cryogenic aluminum conductors
[LA-DC-12990] p0267 N72-17829
- Loss rate and capital costs of storing energy in superconducting coils
[DLB-FB-72-10] p0267 N72-26656
- Design of repetitively pulsed inductive energy storage systems
[AD-755359] p0267 N73-23014
- Weight optimization for energy storage, coil, cryogen, and dewar
[AD-755360] p0267 N73-26054
- Problems and applications of superconductive energy storage
[NASA-TT-F-15109] p0268 N73-31676
- ENERGY TRANSFER**
- Experimental techniques in electrofluid dynamic power generation, discussing energy transfer, ion generation, configuration effects, scaling characteristics and closed cycle operation
[AGARDGRAPH 81] p0124 A68-22538
- DC MHD generator using gas plasma as working fluid, discussing fundamental principle, components interactions and energy conversion
p0157 A69-39165

ENGINE COOLANTS

SUBJECT INDEX

- Satellite solar power stations, considering energy conversion, microwave generators and beam transfer to earth
p0036 A72-11770
- Laser energy transfer - An analytic survey of high power applications.
p0257 A73-22822
- Theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics
[UAPL-31] p0207 N68-37342
- Mirror systems in fuel cycles, loss reduction, and energy recovery
[UCBL-71753] p0092 N70-28899
- ENGINE COOLANTS**
- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant
[AIAA PAPER 68-1091] p0072 A68-44975
- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant
[AIAA PAPER 68-1091] p0115 A69-43725
- Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials
[ICAS PAPER 70-16] p0115 A70-44127
- Methane or hydrogen fuel direct cooling of first stage stator of SST aircraft turbine - numerical heat transfer analysis
[NASA-TN-D-6042] p0117 N70-42326
- ENGINE DESIGN**
- Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion
p0138 A68-42954
- Soviet civil gas turbine engines construction and performance, noting relatively high specific fuel consumption
p0178 A72-21275
- Hydrogen resistor design and testing with Re heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer
[AIAA PAPER 72-449] p0115 A72-26186
- Market trends and technical progress in small gas turbine engines for general aviation and executive aircraft and helicopters
p0187 A73-34447
- Noise reduction modifications in JT3D and JT8D gas turbine engine by single stage fan replacements
[SAE PAPER 730346] p0187 A73-34694
- A solar engine using the thermal expansion of metals.
p0046 A73-38473
- ENGINE INLETS**
- Ceramics replacement for Ni-Cr superalloys to improve automotive gas turbine performance by increasing inlet temperature, considering material selection
p0187 A73-31250
- ENGINE TESTS**
- Two stage gas turbine engine optimal tuning for RPM, thrust, fuel rate and gas temperature, describing automated bench tests
p0170 A70-43361
- ENGINES**
- Design and utilization of fuel and electric cells and heat engines
[AD-743651] p0249 N72-33065
- ENRICHMENT**
- Fuel cycle cost comparisons for low enriched uranium
[ORNL-TM-2173] p0083 N69-17558
- Background information on uranium enrichment for nuclear fuel including costs, operations, and equipment
[ORO-668] p0086 N69-31272
- Coal enrichment wastes suitable for extraction of fuel gas
p0116 N70-10884
- Cost estimates of oxygen blast enrichment of lignite during gasification
p0117 N70-10885
- Facility for uranium enrichment by thermal diffusion
[NP-18173] p0093 N70-37298
- Pilot plant for demonstrating nozzle separation method for uranium enrichment
[NP-TN-1884] p0094 N70-39255
- ENVIRONMENT EFFECTS**
- Rotary wing aircraft ecological advantages in logging, off shore oil exploration and short haul passenger transport for airport size reduction
p0076 A73-33185
- Hypersonic transports - Economics and environmental effects.
p0009 A73-34435
- Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427
- Environmental and ecological effects of coal strip mining in Ohio
[E73-10003] p0019 N73-15339
- Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277
- ENVIRONMENT POLLUTION**
- Pollution free electrical power generation from solar energy, discussing microwave transmission to earth, power shortages, thermal pollution and solar cell manufacture cost
[ASME PAPER 71-WA/SOL-2] p0036 A72-15892
- Solar energy conversion as pollution-free power source, discussing silicon solar cells, power transmission techniques, satellite solar power stations and system control and guidance
p0037 A72-18625
- Power generation for electrical, thermal and transportation needs, considering technology use for air, noise, thermal, water and nuclear pollution reduction
p0037 A72-18627
- Hypersonic transports - Economics and environmental effects.
p0009 A73-34435
- Oil spread over Arctic ice, considering spread rate and oil slick size attainment for pollution potential during spills on tundra or pack ice
[AIAA PAPER 73-701] p0076 A73-36250
- Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809] p0009 A73-38373
- Remote airborne laser fluorosensor for sensing environmental pollution and hydrology
[OTIAS-175] p0099 N72-20479
- Application of ERTS-1 imagery to determine ecological effects of strip mining in eastern Ohio
[PAPER-E2] p0109 N73-28266
- ENVIRONMENTAL CONTROL**
- Organic Rankine cycle system using heat absorption from turbine exhaust to provide increased electrical output and to power air conditioning
p0162 A69-42267
- Fluorocarbon fluid Rankine cycle system utilizing gas turbine exhaust heat for environmental control
[SAE PAPER 700160] p0165 A70-25371
- Environmental radiation and concentration levels of atomic gaseous diffusion plant
[GAT-553] p0010 N68-25106
- Factors relevant to development of fuels and energy policies compatible with environmental control
p0016 N71-29471
- Development of minimum and optimum requirements for environmental surveillance programs around nuclear fuel reprocessing plants
p0095 N71-29878
- Application of nuclear energy to meeting needs of increasing populations and reduction in environmental pollution through use of nuclear energy
[INFCIRC/139/ADD-1] p0017 N71-33879
- Interrelationships between energy, resources, and environment, conference summary
[EB-213031] p0020 N73-20820
- Congressional hearings on research and development of environmentally safe electric power production
p0020 N73-20976

ENVIRONMENTAL ENGINEERING

- Si solar cell design for high power/weight ratio and extreme environmental operating conditions, describing technological innovations for reliability and efficiency enhancement p0039 A72-37780
- Energy sources in US to achieve future electric energy needs and environmental compatibility requirements p0095 N71-29852
- Effect of earth resource utilization on environmental engineering, considering economics and transportation factors p0018 N72-13956

ENVIRONMENTAL INDEX

- Signed diagraphs for forecasting energy demands and analyzing policies for meeting environmental constraints on energy use [R-756-N5F] p0018 N72-20948

ENVIRONMENTAL SURVEYS

- Thermal mapping at electrical power generating sites for outfall from fossil or nuclear fuel plants, considering airborne application p0076 A73-33360
- Thermal activity of the Uson Caldera based on infrared and photographic aerial survey. p0077 A73-39895
- Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1 [EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367
- Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2 [EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368

ENVIRONMENTAL TESTS

- Solar array and supporting technologies development, discussing manufacturing, handling, design qualification tests in space environment and comparison between fold-up and roll-up types p0041 A73-14237
- Continuous testing of environment at Marcoule chemical plant for irradiated fuel treatment [NLL-RISLEY-TRANS-1866-9091.9P] p0091 N70-20596
- Solar array development discussing manufacturing, design qualification tests in aerospace environments, and comparison between fold-up and roll-up types [RAE-TR-72109] p0067 N73-21959

ENVIRONMENTS

- Effect of energy demands on ecology and efforts to preserve environment from degradation and contamination [BNL-16228] p0018 N72-20371

SOLE SATELLITES

- Sole monitoring of drifting buoys and balloons in Southern Hemisphere for oceanographic and meteorological data [NASA-TT-F-14279] p0100 N72-25345

EPITAXY

- Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response p0039 A72-30225

EQUATIONS OF STATE

- Book on energy conversion statics covering state functions, quasi-static processes, internal energy, chemical energy storage and conversion, dynamics and postulates and laws p0166 A70-27670
- Magnetohydrodynamic generator systems analysis including electrical impedance and power conversion efficiency calculations for various designs p0241 N71-26449

EQUIPMENT SPECIFICATIONS

- Silicon solar cell specifications and cost reduction without output or reliability loss p0033 A70-41008

ERRORS

- Parametric analysis of effects of concentrator surface errors and rim angle, collection system orientation error, and receiver temperature on paraboloid solar collector thermal efficiency [NASA-TN-D-4415] p0047 N66-18998

ESRO 1 SATELLITE

- Design of ESRO 1, ESRO 2, and HEOS A power systems and control equipment [ESRO-TN-83] p0057 N70-17621

Reliability analysis of solar generator on ESRO 1 satellite

[NASA-TT-F-14498] p0065 N73-10051

ESRO 2 SATELLITE

Design of ESRO 1, ESRO 2, and HEOS A power systems and control equipment [ESRO-TN-83] p0057 N70-17621

EUROPEAN SPACE PROGRAMS

Nuclear power supply with in-core thermionic reactor for space power source and use in satellite TV, discussing theory, design and components p0142 A69-20871

Incore thermionic reactor application to meet European TV broadcasting satellite and submarine and underwater laboratory power requirements p0181 A72-36166

EVAPORATION RATE

Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films. [WSCI PAPER 72-27] p0075 A73-16687

EXCITATION

Breadboard model of Brayton cycle alternator and voltage regulator-exciter [NASA-TN-D-4697] p0204 N68-29960

EXHAUST GASES

Organic Rankine cycle system using heat absorption from turbine exhaust to provide increased electrical output and to power air conditioning p0162 A69-42267

Fluorocarbon fluid Rankine cycle system utilizing gas turbine exhaust heat for environmental control [SAE PAPER 700160] p0165 A70-25371

Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality p0075 A72-28879

Nitrogen oxide turbojet emissions minimization with hydrogen compared to kerosene /JP/ fuels due to flammability limits, burning velocity and introduction in combustor as gas p0116 A73-37498

Influence of volatile fuel components on vehicle emissions [BM-RI-7291] p0117 N70-26511

Investigating petroleum products for capacity to absorb sulfur dioxide from industrial waste gases [NRL-RTS-5464] p0091 N70-20779

Comparative emissions from leaded and prototype lead free automobile fuels [BMRI-7390] p0092 N70-28685

Congressional hearings on air pollution control research in motor vehicle, aircraft, and diesel exhausts, and industrial and federal facilities wastes p0015 N70-36154

Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TN-D-6404] p0096 N71-31456

Developmental program for SO₂, NO, and particulate pollutant level lowering and control in flue gas from fossil fuel combustion using fluidized beds with limestone [ANL/ES-CEN-1003] p0096 N71-36736

Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines [PB-200144] p0097 N72-10830

Annotated bibliography on environmental pollution caused by aircraft emissions [AD-735943] p0099 N72-23655

Analytical measurements of exhaust emissions from aircraft turbine engines using Jet A fuel [BM-RI-7634] p0100 N72-25584

Air pollutants in exhaust gas produced from LP-gas used in automotive engines [BM-RI-7672] p0101 N72-31768

Analysis of major pollutants produced by aircraft engine exhaust and development of techniques to reduce level of pollutant emission [NASA-TN-X-68129] p0102 N72-32754

Effect of fuel zoning and fuel nozzle design on exhaust pollution emissions at ground idle conditions for double-annular ram-induction combustor for turbofan engines [NASA-CR-121094] p0104 N73-17916

- Alternate fuels to reduce aircraft exhaust pollutants
[AD-755151] p0106 N73-20815
- Testing Association of automotive fuel composition with exhaust reactivity using different engines and gasolines of varied composition
[SM-BI-7756] p0109 N73-27542
- EXHAUST SYSTEMS**
- Reduction of harmful emissions of turbine engine exhaust system p0097 N72-11675
- EXHAUST VELOCITY**
- Hydrogen resistojet design and testing with Re heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer
[AIAA PAPER 72-449] p0115 A72-26186
- EXPANDABLE STRUCTURES**
- Geometric properties of expandable whirling membrane solar energy concentrator used in conjunction with electrical conversion systems for spacecraft auxiliary power units
[NASA-TN-D-4532] p0048 N68-22258
- Performance of expandable whirling membrane solar energy concentrator
[I-5484] p0049 N68-27926
- Expanding and contracting connector strip for solar cell array of Nimbus satellite
[NASA-CASE-XGS-01395] p0053 N69-21539
- Performance characteristics and weight variations of large area, roll-up, solar arrays
[NASA-CR-115821] p0060 N71-13427
- EXPERIMENTAL DESIGN**
- Plutonium isotope reentry vehicle experimental design study
[NASA-CR-72366] p0081 N68-25283
- Design and tests of MHD induction generator operating on liquid flow
[NASA-CR-110154] p0233 N70-29169
- EXPLOITATION**
- Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology
[SM-112/24] p0084 N69-30799
- Natural isotopic distribution studies for evaluation of new hydrocarbon deposits
[SM-112/27] p0085 N69-30801
- EXPLORATION**
- Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics p0084 N69-30776
- Gamma ray logging in uranium prospecting
[SM-112/15] p0084 N69-30790
- Exploration of nonagricultural earth resources of economic significance by United Nations in developing countries p0099 N72-23295
- EXPLOSIVE DEVICES**
- Design and performance of explosive driven magnetic generators, giving line drawings and current oscillograms p0120 A68-15139
- Explosive devices for converting explosive energy into magnetic fields for direct power generators
[UCRL-TRANS-10133] p0192 N68-14541
- Explosive magnetohydrodynamic programs
[AD-762934] p0254 N73-30890
- EXPLOSIVES**
- Electrical behavior of various magnetohydrodynamic generators using explosives
[CEA-R-3714] p0222 N69-30078
- EXTRACTION**
- Coal enrichment wastes suitable for extraction of fuel gas p0116 N70-10884
- F**
- FABRICATION**
- Solar cell array fabrication methods extending operating temperature by pulsed spot welding techniques and deletion of adhesives p0031 A70-12080
- Silicon solar cell fabrication technology developments for long mission life performance reliability over wide temperature and radiation intensity ranges p0038 A72-28029
- Tables summarizing Si solar cell fabrication parameters, complex design evolution and performance achievement p0040 A73-14204
- Solar energy concentrator technology, design, and fabrication techniques
[NASA-TN-X-59043] p0049 N68-27643
- Economic fabrication of nuclear fuel-uranium monocarbide for reactors
[EUR-4273.D] p0086 N69-34967
- Fabrication and test evaluation of lightweight solar panels
[NASA-CR-66832] p0055 N69-38646
- Fabrication methods for matrices of solar cell submodules
[NASA-CASE-INP-05821] p0060 N71-11056
- Method and apparatus for fabricating solar cell panels
[NASA-CASE-INP-03413] p0062 N71-26726
- Development of technology for fabricating and integrating solar cell array into deployable system
[NASA-CR-112002] p0063 N72-13046
- FACILITIES**
- Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases
[PB-198775] p0017 N71-32624
- FAILURE ANALYSIS**
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc p0028 A69-42271
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc p0031 A70-15329
- German monograph on thermionic power supply equipment converter network reliability covering I-V characteristics and failure probability calculation p0177 A72-15696
- Failure data handbook for liquid metal cooled nuclear power plants
[LMCC-MEMO-69-7-VOL-1] p0234 N70-31239
- Applicability of NASA contract quality management and failure mode effect analysis procedures to USGS Outer Continental Shelf oil and gas lease management program
[NASA-TN-X-2567] p0100 N72-25955
- FALLOUT**
- Aerial detection of Co 60 fueled radioisotope thermoelectric generators
[SC-TN-68-627] p0013 N69-19492
- FARADAY EFFECT**
- Closed cycle MHD experimental facility characteristics, discussing seeding, Faraday and Hall voltage measurements and plasma conductivity p0127 A68-23929
- Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field p0157 A69-39027
- Emission characteristics of refractories and magnetic field influence on current distribution along electrodes - MHD generators
[SM-74/92] p0210 N69-13319
- Plasma flow in duct of series MHD generator
[SM-74/225] p0212 N69-13339
- Measurements of potential and current density distributions in simulated Faraday-type MHD generator working with argon-potassium plasma
[IPP-3/104] p0234 N70-31285
- Gas velocity and temperature distribution effects on electrical parameters of Faraday-type MHD generator
[INR-1095] p0235 N70-33547
- FARMLANDS**
- ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386
- FAST NUCLEAR REACTORS**
- Nuclear research and power plant developments in various countries, and operating experience with fast reactors and breeder reactors
[JPRS-43265] p0010 N68-10725

SUBJECT INDEX

FLAMMABILITY

- Nonlinear dynamic model of nuclear power plants with single-phase coolant reactors
[AB-341] p0217 N69-21373
- Uranium fueled fast steam cooled reactors in SNEAK series
[EUFNR-608] p0085 N69-31161
- Cooling systems for fast reactor cores
[EUFNR-615] p0086 N69-31655
- Fast breeder reactor design considerations of blanket cycle efficiency and management
p0086 N69-31987
- Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs
p0087 N69-35240
- Utility needs and reliability of operational fast breeder reactors
p0087 N69-35243
- Research in Japan for developing fast reactor mixed oxide nuclear fuels
[NLL-DOUNRE-TRANS-419-/9091.9F/1] p0091 N70-21080
- Fuel depletion and sodium void coefficients, and economic evaluation of sodium cooled fast nuclear reactor
p0230 N70-22218
- FATTY ACIDS**
Minerally entrapped fatty acids analyzed after demineralization liberation of exhaustively extracted oil shale from Green River Formation
p0071 A68-27231
- Generation of hydrocarbons from straight chain fatty acid, formation of long chain n-alkanes, and origin of crude oil
p0078 N68-10414
- FEASIBILITY**
Feasibility of power by nuclear fusion
[ORNL-TM-2204] p0204 N68-30162
- FEASIBILITY ANALYSIS**
Feasibility analysis of satellite solar/thermal power generation and transmission to earth, describing Brayton cycle heat engine for initial energy conversion
p0046 A73-38404
- Feasibility of satellite solar power station technology concepts, discussing cost analysis, energy conversion efficiency, weight, space environment and microwave transmission
p0046 A73-39247
- Feasibility of mobile nuclear reactor power plants for cargo transportation and development of remote regions on earth
[NASA-TM-X-68164] p0020 N73-15693
- FEEDBACK CONTROL**
NASA Lewis closed loop MHD generator subsonic tests, discussing ducts, purge and Cs injection systems, electrode coating, etc
p0169 A70-40011
- Feedback controlled dc to dc converter with input/output isolation for voltage regulation
[NASA-CASE-HQN-10792-1] p0248 N72-27230
- FERROMAGNETISM**
Induced magnetic fields determination in linear DC MHD generators with ferromagnetic and nonmagnetic walls, using Fredholm equation
p0143 A69-23454
- FIBER STRENGTH**
High strength straight filament superflywheel configurations with improved energy storage capability for vehicle, tool and power supply applications
p0263 A73-14744
- FIELD COILS**
Rotating electrical machine superconducting field winding design requirements in terms of size, magnetic energy storage, power level, rotation speed and pole number
p0182 A73-11828
- FIGURE OF MERIT**
Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect
p0162 A70-10754
- Thermoelectric cooling devices materials figure of merit upper limits above room temperature, using semiconductor parameters experimental values
p0179 A72-27722
- FILTRATION**
Filtration of heat carriers in earth core rocks at depths from 6 to 8 kilometers
p0090 N70-16588
- FIRE EXTINGUISHERS**
Aerial infrared scanner to locate and detect subsurface coal fires
p0086 N69-33683
- FIRE PREVENTION**
SNAP 19 residual fire test on its dispersion system generator, dispersion system capsule, intact reentry heat source generator system, and intact reentry heat source capsule
[SC-DR-69-490] p0230 N70-19359
- Aircraft fuel system fire safety and prevention, and jet aircraft air pollution
p0094 N70-40779
- FIRES**
Feasibility of detecting subsurface coal fires in Wyoming and Montana from ground observation, aerial photography, and satellite imagery
p0107 N73-22384
- FISSION**
Available energy sources and sources of future including nuclear fusion and fission
[LA-DC-9519] p0010 N68-28181
- Critical fuel loading, core hot-spot power generation, and detailed fission rate measurement of critical or subcritical reactors
p0088 N70-14123
- FISSION PRODUCTS**
Radioisotopes as energy source for power conversion systems, discussing future availability of fission products and transuranium elements from commercial nuclear power reactors
p0074 A71-38948
- Pilot plant for solvent extraction of strontium 90 from fission products
[EUR-3613.F] p0078 N68-10864
- Energy conversion in vapors ionized by fission products
p0196 N68-17808
- Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry
[CONF-680610] p0087 N69-37355
- Mixed fission products potential as thermal and gamma energy sources
[BNWL-1115] p0224 N69-38506
- Radon daughter equilibrium measurements in uranium mine atmospheres
p0088 N70-14317
- Radioactive dust in air at KUR operation from fission production of fuels and activated aerosols
[KURRI-TR-56] p0091 N70-21010
- Gaseous fission, closed loop, MHD generator in nuclear electric power plant
p0243 N71-33632
- Fossil fuel and nuclear fission resources for energy
[A/CONF-49/P/359] p0098 N72-16981
- FLAME IONIZATION**
Nonequilibrium modes of MHD converters, discussing electrically and magnetically induced nonequilibrium ionization, inhomogeneous flow, radical and ion recombination in combustion systems
[AGARDGRAPH 81] p0123 A68-22531
- FLAME PROPAGATION**
Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air
p0080 N68-19175
- FLAME TEMPERATURE**
The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel
p0075 A73-12955
- Experimental investigation of MHD generator
[SM-74/206] p0211 N69-13331
- FLAMMABILITY**
Differential equations for calculating factors causing spontaneous combustion in coal seams
p0090 N70-16595

FLAMMABLE GASES

SUBJECT INDEX

FLAMMABLE GASES

System and facility for generating electricity and gas from lignite using high temperature nuclear reactor
[JUL-554-RG] p0264 M69-13298

FLAME POINT

Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air p0080 M68-19175

FLAT PLATES

Flat plate collector performance evaluation using simulated sun
[NASA-TX-X-71427] p0068 M73-32655

FLEXIBLE BODIES

Oriented flexible rolled-up solar array /FRUSA/ for spacecraft electric power generation, describing orientation and deployment mechanisms, solar panel, system operation, etc
[AIAA PAPER 70-738] p0032 A70-25434
American and European solar generator technology development review, discussing roll-up arrays, flexible panels, and stowage and deployment system components p0038 A72-28005

FLIGHT CHARACTERISTICS

Flight range and fuel consumption formulas of power gliders used for transportation compared with automobiles p0073 A69-43142

FLIGHT CONTROL

Modern control techniques applied to energy conservation flight control systems. p0263 A73-38415

FLIGHT TESTS

Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption
[SAE PAPER 710369] p0073 A71-24239

FLORIDA

Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast p0096 M71-35178

FLOW CHARACTERISTICS

Plasma flow in MHD generator channel with series connected electrodes analyzed to select flow regimes p0122 A68-19561
Striated flow production in induction synchronous MHD generator by nonthermal ionization of inert seeded gas in generator internal electric field p0128 A68-23931
Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs p0087 M69-35240
Development of method for analyzing performance of magnetohydrodynamic generator based on thermodynamic properties and flow characteristics p0252 M73-19051

FLOW CHARTS

Costs and flow charts for thorium and uranium recovery from HTGR fuel elements containing silicon carbide coated fissile and fertile particles
[GAND-8661] p0083 M69-17117

FLOW EQUATIONS

Optimum operation modes of MHD converter p0142 A69-23095

FLOW STABILITY

Rayleigh-Taylor instability in synchronous liquid metal MHD generators, showing stabilization by channel positioning and threshold power rating p0150 A69-27508

FLOW THEORY

Rumanian book on MHD covering electromagnetic field theory, motion equations, laminar flow, MHD generators, fluid motion past thin airfoils, shock waves, etc p0157 A69-41363
Axial pressure, electric current and potential distribution in two-phase particulate electroqasdynamic flow, discussing space charge electric field effect p0170 A70-40257
Plasma flow in duct of series MHD generator
[SM-74/225] p0212 M69-13339

FLOW VELOCITY

Impulse induction MHD generator with cylindrical channel, finding differential equations for velocity and current p0185 A69-23484
Variable fluid and field velocity HF induction generator, determining interaction between fluid dynamic forces and magnetic field and kinetic energy p0150 A69-27502
Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field p0157 A69-39027
One wavelength MHD induction generator, discussing field pressure gradients, fluid velocities, excitation and electrical output power p0169 A70-40015

FLOWMETERS

Magnetohydrodynamic pumps and generators p0232 M70-28078

FLUID DYNAMICS

Characteristics and applications of electrofluid dynamic processes p0215 M69-18440
Performance characteristics of electrofluid dynamic generators p0215 M69-18441
Physical and theoretical aspects of viscous electrofluid dynamic energy conversion processes p0216 M69-18442
Dielectric strength of gas mixtures for electrofluid dynamic generators p0216 M69-18444
Approximative solution for charge cloud growth in electrofluid dynamic generator p0216 M69-18445
Research on electrofluid dynamic energy conversion in Belgium p0216 M69-18446
Design and construction of magnetogasdynamic plasma power generator in Canada p0216 M69-18447
Hall converter for space charge neutralized electrofluid dynamic energy converter p0216 M69-18450

FLUID FILMS

Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films.
[WSCI PAPER 72-27] p0075 A73-16687

FLUID FLOW

Striated flow production in induction synchronous MHD generator by nonthermal ionization of inert seeded gas in generator internal electric field p0128 A68-23931
Variable fluid and field velocity HF induction generator, determining interaction between fluid dynamic forces and magnetic field and kinetic energy p0150 A69-27502
Piston-type flow for regulating distribution instability in liquid metal synchronous magnetohydrodynamic generator
[AD-685487] p0221 M69-29892
Viscous incompressible fluid hydraulics of magnetohydrodynamic generators
[AD-751465] p0252 M73-16718

FLUID INJECTION

Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities
[JPRS-46752] p0208 M69-11943
Thermodynamic properties of liquid metal cycle in magnetohydrodynamic power generator with heat regeneration p0208 M69-11944

FLUID TRANSMISSION LINES

Hydrostatic power transmission systems classifications, considering transformation, transport and accumulation of energies /mass, heat, optical, chemical, pneumatic, hydraulic, etc/ p0257 A71-36202

FLUIDIZED BED PROCESSORS

Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry
[CONF-680610] p0087 N69-37355

Developmental program for SO₂, NO, and particulate pollutant level lowering and control in flue gas from fossil fuel combustion using fluidized beds with limestone
[ANL/ES-CEN-1003] p0096 N71-36736

FLUORESCENCE

Remote airborne laser fluorosensor for sensing environmental pollution and hydrology
[UTIAS-175] p0099 N72-20479

Excitation and fluorescence spectra for identifying Navy fuel and fuel oils in sea water
[AD-743703] p0102 N72-33736

FLUORIDES

Fuel treatment by selective volatilization of uranium and plutonium fluorides
[CEA-CONF-1195] p0083 N69-25510

FLUX (RATE)

Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations
p0183 A73-20396

FLUX DENSITY

Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model
p0130 A68-29186

High energy density silver-hydrogen cells for space and terrestrial applications.
p0188 A73-38403

Performance of helium seeded with uranium in magnetohydrodynamic generator
p0243 N71-33663

FLYBY MISSIONS

Solar arrays for Venus-Mercury flyby, evaluating temperature and power performance
p0033 A70-41010

FLYWHEELS

Stress and materials analysis of Fiberglas epoxy composite flywheels used for short term energy storage
p0261 A69-12853

Coupling with liquid metal flywheel rotating under action of crossed electric and magnetic fields
p0123 A68-20399

High strength straight filament superflywheel configurations with improved energy storage capability for vehicle, tool and power supply applications
p0263 A73-14744

Mechanical energy storage by flywheel with magnetic fluid hermetic seal and bearing, using anisotropic and whisker materials
p0263 A73-25979

Primary energy storage and advanced flywheel configurations with application to urban electric vehicles
[AD-697906] p0265 N70-22537

Feasibility of using flywheel or flywheel-hybrid propulsion systems on automobiles and buses for air pollution reduction
[PB-200143] p0266 N72-11410

Application of isotenoid flywheels to spacecraft energy and angular momentum storage
[NASA-CR-1971] p0266 N72-17020

FOAMS

Storage stable, thermally activated foaming compositions for erecting and rigidizing mechanisms of thin sheet solar collectors
[NASA-CASE-LAR-10373-1] p0062 N71-26155

FOIL BEARINGS

Design, fabrication, and stability testing of foil gas bearing test rig
[NASA-CR-1563] p0231 N70-25623

FOSSILS

17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734

FOURIER SERIES

One-wavelength MHD induction generator operated on NaK flow system with various excitation conditions, calculating magnetic flux density and power by Fourier series
p0179 A72-29364

FRACTURING

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry
[E72-10064] p0102 N72-32336

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10371] p0165 N73-19366

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana
[E73-10776] p0108 N73-27252

Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277

Application of ERTS-1 imagery to fracture-related mine safety hazards in Ohio coal mining industry
[E73-11034] p0112 N73-31338

FREDHOLM EQUATIONS

Induced magnetic fields determination in linear DC MHD generators with ferromagnetic and nonmagnetic walls, using Fredholm equation
p0143 A69-23454

FREE ENERGY

Chemical power conversion to mechanical or electrical energy noting relation to temperature limits of heat for heat engine
p0123 A68-20734

FREE JETS

Generation of electric power by liquid sodium-jet MHD generator
[NASA-CR-97864] p0214 N69-13391

FREIGHT COSTS

Energy used in intercity freight transportation by water, rail, pipeline, truck, and air, and effect of fuel price increases
[R-804-NSF] p0258 N72-23979

FRENCH SPACE PROGRAMS

Accurate localization by the Geole Project satellite
p0075 A73-17192

FREQUENCY ASSIGNMENT

Three phase DC-AC inverter with low harmonic distortion, good efficiency and packaging capability, stabilizing frequency by crystal controlled clock oscillator
p0162 A69-42294

FREQUENCY CONTROL

Design and testing of 1200-Hz alternator and voltage and frequency controls for Brayton space power systems
[NASA-TN-X-52453] p0205 N68-31042

FREQUENCY MODULATION

Stability of MHD generator plasma under potential perturbation waves in ionized component of working body
p0121 A68-18285

FREQUENCY RESPONSE

Silicon violet solar cell energy conversion efficiency improvement through extended spectral response and increased fill factor
p0040 A73-14212

FREQUENCY STABILITY

Three phase DC-AC inverter with low harmonic distortion, good efficiency and packaging capability, stabilizing frequency by crystal controlled clock oscillator
p0162 A69-42294

FRICTION

Aromatic hydrocarbon influence on lubricity of petroleum oils, noting mixtures with paraffins, low loads scuffing and decomposition
p0071 A68-41768

FRICTION FACTOR

MHD induction generator design, considering electrical and friction loss measurement and control
p0167 A70-39988

Effect of wall friction on magnetohydrodynamic generator performance determined by introduction of wall friction factor into one-dimensional generator equations
[NASA-TN-D-6804] p0247 N72-24755

FUEL CAPSULES

SUBJECT INDEX

FUEL CAPSULES

- Fuel capsule vent system development for the
Viking radioisotope thermoelectric generator.
p0077 A73-40766
- Subassembly test program in Spert 4 capsule driver
core for FY 1969 and 1970
[IX-1313] p0088 N70-13396

FUEL CELLS

- Hydrazine-air fuel cells design features,
auxiliary components and performance
characteristics p0119 A68-13240
- Fuel cell system performance related to reactant
properties, tabulating values for cell design
factors p0125 A68-22541
- [AGARDOGRAPH 81] p0125 A68-22541
- Electrochemical and chemical catalysis differences
due to applied field and solvent, discussing
fuel cell reaction rates enhancement in
electrochemical energy conversion
[AGARDOGRAPH 81] p0261 A68-22542
- Fuel cells history, development and operation
emphasizing materials, applications and
engineering problems for cells using hydrogen
and oxygen /pure or as air/ p0128 A68-24323
- Book on direct energy conversion covering fuel
cells, thermionic and thermoelectric systems,
radiation cells, fusion plasma and other HED
generators p0132 A68-36891
- Materials limitations and problems for direct
energy conversion methods of thermoelectricity,
solar cells, thermionics and fuel cells p0133 A68-41217
- Book on fuel cells and fuel batteries covering
thermodynamics, electrocatalysis, overvoltage,
Gemini spacecraft battery, etc p0139 A68-44312
- Handbook of fuel cell technology covering
electrochemical theory, ion exchange, economics,
etc p0139 A68-44776
- Carbon fuel cell technology, describing
manufacturing processes for three types of
carbon electrodes p0139 A68-44779
- Direct energy conversion and materials
limitations, discussing thermoelectricity, solar
cells, thermionics and fuel cells p0140 A69-11801
- Secondary cells with liquid lithium anodes and
immobilized fused salt electrolytes p0262 A69-15330
- Cold hydrogen and basic electrolyte cells at CGE
research center, discussing single cell
batteries, reagent chambers and auxiliary
control systems p0115 A69-21039
- Fuel cells utilizing direct electrochemical
conversion of energy of radioactive elements p0142 A69-21054
- Medium temperature fuel cells advantages including
improved electrochemical reaction kinetics,
water and heat removal p0156 A69-32417
- Fuel cells with solid membranes with ion
conductivity, discussing proton electrolyte p0156 A69-32424
- Molten carbonate fuel cells power source for
military applications, considering catalytic
recycle reformer p0164 A70-20703
- Catalytic load carrying capacity of porous carbon
electrodes impregnated with nickel salt and
nickel boride in anodic fuel cell hydrazine
oxidation p0164 A70-24469
- Fuel cells power density improvement under pulsed
loading at high current density and constant
voltage p0166 A70-27758
- Book on fuel cells electrochemistry covering
direct energy conversion methods, electrode
kinetics, electrocatalysis, organic substances,
electrochemical combustion, research techniques,
etc p0166 A70-30100

- LPG use in fuel cells, discussing efficiency,
weight and size p0073 A70-36657
- High temperature fuel cell with thin disk solid
electrolyte, evaluating performance as function
of electrolyte, electrode and current collector
resistance ratio p0170 A70-42499
- Hydrazine-fuelled battery low power consumption
auxiliary system with voltage regulator and gas
pumps p0170 A70-43539
- Hydrazine-oxygen fuel cell design and operation,
discussing efficiency, electrolyte space, etc p0170 A70-43541
- Batteries and fuel cells as portable and
transportable electrochemical power sources p0171 A70-46399
- Book on fuel cells covering types, applications,
thermodynamics, chemical reactions, direct
electrical generation, etc p0171 A71-11192
- Book on direct energy conversion principles and
methods covering fusion, fuel cells, HED,
thermoelectric, thermionic, photovoltaic,
electrohydrodynamic, piezoelectric and
ferroelectric power generation p0171 A71-11193
- Hydrazine-oxygen fuel cells energy costs
minimization by optimizing diaphragm thickness,
hydrazine concentration and load p0171 A71-14321
- Hydrogen depolarized fuel cell for space station
prototype carbon dioxide concentrator,
describing modular design concept and operation
[ASME PAPER 71-AV-37] p0174 A71-36404
- Power supply and converters for satellite and
spacecraft, discussing fuel cells,
radioisotopes, nuclear reactors, etc p0177 A72-16745
- Proportional-integral control of reactants supply
for hydrazine-oxygen fuel cells with pulse
controlled solenoids p0177 A72-18290
- Monograph on fuel cells covering thermodynamics,
electrode polarization principles,
electrocatalysis, system requirements,
operational principles and applications p0178 A72-24700
- Electrocatalysis and fuel cells - Conference,
Seattle, December 1970 p0180 A72-33876
- Alkaline fuel cell development and trends, noting
carbon dioxide removal technique and
applications ranging from portable batteries to
automobile power p0180 A72-33887
- Cubic stabilized zirconia utilization as solid
electrolyte in high temperature fuel cell system
for efficient and economical energy conversion p0263 A72-33894
- High temperature zirconium dioxide electrolyte
fuel cell systems design and operation with
methane or gasoline as fuel, evaluating
performance characteristics p0182 A73-15118
- Fuel cells for improved electrical power supply.
[AIAA PAPER 73-82] p0183 A73-17641
- Autonomous hydrogen/air fuel cell for long-life
missions. p0184 A73-22752
- The phosphoric acid fuel cell, a long life power
source for the low to medium wattage range. p0184 A73-22821
- Calculation and comparison of the economics of
electrochemical fuel cells p0185 A73-25346
- Power Sources Symposium, 25th, Atlantic City,
N.J., May 23-25, 1972, Proceedings. p0187 A73-29581
- Long-life light weight reliable fuel cell
development for long term space missions power
supplies, describing system components and
construction materials p0044 A73-29596
- Megawatt fuel cells for aerospace applications. p0045 A73-29597

SUBJECT INDEX

FUEL CONSUMPTION

Optimizing power efficiency of hydrazine-oxygen fuel cells. p0187 A73-29598

High power density hydrazine-oxygen fuel cell, discussing cell polarization, critical resistance losses and efficiency p0188 A73-38398

High energy density silver-hydrogen cells for space and terrestrial applications. p0188 A73-38403

Hydrazine and methanol fuel cells comparison with hydrogen-air cells in terms of fuel costs and conversion efficiency, considering electric generators and automotive applications p0116 A73-45025

Advanced fuel cell breadboard model and component testing [NASA-CR-902101] p0191 N68-11030

Design, testing, and performance of 5-kilowatt hydrazine/potassium hydroxide air fuel cell modules [N884026F] p0191 N68-11503

High efficiency coal oxidation solid electrolyte fuel cell [OCR-171] p0192 N68-12477

Fuel cell-battery hybrid power source for electric cars [AD-662235] p0193 N68-15525

Fuel cell-battery hybrid power source for automobiles [AD-662236] p0193 N68-15641

Fuel cell-battery hybrid power source for electric vehicular propulsion [AD-662234] p0194 N68-15712

Oxygen electrode kinetic factors in fuel cell energy conversion processes p0199 N68-17824

Oxygen electrodes for fuel cells, and mechanism in transport of oxygen near line separating gas electrolyte electrode p0200 N68-18025

Design of fuel cells, hydrogen generator, power plant for indirect hydrocarbon-air systems [PWA-32111] p0200 N68-20884

Materials, plasma, and electrochemical research on unconventional energy conversion techniques [NASA-CR-93979] p0010 N68-21035

Summary of 30-years of research on molten carbonate fuel cells with both aqueous and nonaqueous electrolytes [REPT.-67-C-210] p0201 N68-21439

Battery and fuel cell power sources for electric cars [RCOM-2929] p0202 N68-23140

Optimum design of spacecraft power supply systems using fuel cells, and characteristics of energy conversion methods p0203 N68-28738

Parametric performance and design criteria for assessing feasibility of large solar array and fuel cell systems as primary power source for lunar-based water electrolysis system [NASA-CR-61979] p0051 N68-36000

Power systems research reviews at Marshall Space Flight Center p0215 N69-18068

Ion adsorption mechanism and electrochemical energy conversion on fuel cell electrode [NASA-CR-100892] p0219 N69-25396

Fuel cells and microwave equipment of balloon electrical power systems [AD-682898] p0219 N69-25803

Hydrazine-air fuel cell controls [AD-684339] p0221 N69-28781

State-of-art in development of battery power sources for automobiles p0265 N69-34689

Rotating disks, current and potential distribution in cylindrical geometries, foaming electrolyte fuel cell, and iodine cathode p0223 N69-34813

Molten carbonate fuel cell and molten electrolyte battery for electrically and thermally efficient power source with fast transient response [AD-692538] p0226 N70-10447

Electrochemical energy storage and electricity generation for space power sources p0229 N70-16227

Physical and technical problems of direct conversion of chemical energy into electrical [AD-696497] p0229 N70-18341

Fuel cells and storage batteries for different types of energy conversion [AD-696428] p0230 N70-21253

Ultrareliable power processor for hydrocarbon-air fuel cell power systems [AD-699311] p0231 N70-23985

Comparison of Brayton cycle power plant and fuel cell for underwater vehicles [AD-709387] p0238 N70-42951

Conference on fuel cells and batteries [AD-718833] p0016 N71-23353

Characteristics and application of high temperature fuel cells as power sources [AD-727497] p0244 N71-37624

Design and development of 1.5 kilowatt fuel cell powerplant for field use [AD-730796] p0246 N72-14040

Design of hydrogen generating fuel cell [AD-733931] p0118 N72-18520

Conceptual design, component assembly, feasibility tests, and evaluation of advanced fuel cell technology [NASA-CR-115572] p0247 N72-23053

Hydrazine air fuel cell power generating module capable of 120 watts continuous output [AD-744477] p0249 N72-32078

Design and utilization of fuel and electric cells and heat engines [AD-743651] p0249 N72-33065

Low temperature research for low cost improvement of acid fuel cell stacks [AD-744806] p0249 N72-33068

Fuel cell applications as power supplies for rail transportation [AD-747512] p0250 N73-13056

Construction, operation, and applications of fuel cells to show advantages and limitations [NASA-SP-5115] p0253 N73-26045

Portable open cycle fuel cell power plant capable of operation on military fuels [AD-764285] p0254 N73-30979

Characteristics of hydrazine-oxygen fuel cell operating under moderate temperature conditions and various power density concentrations [AD-764530] p0255 N73-33009

FUEL COMBUSTION

Petroleum sulfides advantageous effect on oxygen consumption during combustion p0072 A69-19456

Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination p0074 A71-28754

The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel p0075 A73-12955

Pollutants from methane fueled gas turbine combustion. [ASME PAPER 72-WA/GT-3] p0075 A73-15867

Comparison of ASTM-A1 liquid fuel and natural gas fuels in annular turbojet combustor at Mach 3 [NASA-TM-X-52700] p0087 N70-12102

Developmental program for SO₂, NO, and particulate pollutant level lowering and control in flue gas from fossil fuel combustion using fluidized beds with limestone [ANL/ES-CEN-1003] p0096 N71-36736

FUEL CONSUMPTION

Flight range and fuel consumption formulas of power gliders used for transportation compared with automobiles p0073 A69-43142

High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature p0172 A71-24218

Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption [SAE PAPER 710369] p0073 A71-24239

FUEL CONTAMINATION

SUBJECT INDEX

Soviet civil gas turbine engines construction and performance, noting relatively high specific fuel consumption p0178 A72-21275

Liquid metal regenerator design and test evaluation for gas turbine engine fuel consumption improvement [ASME PAPER 72-GT-33] p0178 A72-25629

Future projections of commercial jet aircraft fuel demands, estimating engine exhaust effects on air quality p0075 A72-28879

Program for assessment of natural uranium consumption of different types of thermal reactors [RISO-M-684] p0082 N68-33991

Design and performance of turbofan engines [AD-683118] p0220 N69-26520

Cost analyses for thermal-hydraulic, physics, and fuel-cycle economics of pressurized water reactors using annular metal pins as fuel [ORNL-TM-2493] p0088 N70-12423

Thermonuclear power reactor design using lithium blanket for plasma control and regeneration of tritium fuel consumed in basic reaction [ORNL-71500] p0226 N70-12638

Examining fuel cycle codes using different techniques for fuel cost calculations [BNWL-SA-3605] p0094 N71-21050

Energy used in intercity freight transportation by water, rail, pipeline, truck, and air, and effect of fuel price increases [R-804-NSF] p0258 N72-23979

Interrelationships between energy, resources, and environment, conference summary [PB-213031] p0020 N73-20820

Fuel consumption profiles of passenger and freight transportation modes [P-4935] p0021 N73-23962

Use of energy in transportation and implications for future [P-5025] p0113 N73-33921

FUEL CONTAMINATION

Petroleum sulfides advantageous effect on oxygen consumption during combustion p0072 A69-19456

Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination p0074 A71-28754

FUEL OILS

Minerally entrapped fatty acids analyzed after demineralization liberation of exhaustively extracted oil shale from Green River Formation p0071 A68-27231

Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner p0074 A72-16600

Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields p0257 A73-33183

Microorganism growth with petroleum fuels [AD-68C804] p0083 N69-20205

Trace element characterization in oil polluted water by neutron activation analysis p0088 N70-15236

Oil spill incidents and oil pollution effects on biological systems and earth ecology bibliography [PB-188206] p0014 N70-21569

Petroleum products handbook - spark ignition piston, air breathing, jet, and diesel engine fuel systems [AD-698440] p0092 N70-23C46

Using neutron activation analysis for quantitative measurement of trace elements in crude and residual fuel oils [GA-9889] p0094 N71-15083

Effectiveness of remote sensor techniques for detecting oil films on water surface [AD-728422] p0098 N72-14478

Excitation and fluorescence spectra for identifying Navy fuel and fuel oils in sea water [AD-743703] p0102 N72-33736

Technologies for production and utilization of petroleum, natural gas, oil shale and coal [BM-IC-8612] p0111 N73-30335

Solar energy, thermonuclear energy, and fossile fuel energy sources [UCRL-74697] p0022 N73-33005

Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity p0022 N73-33928

FUEL SYSTEMS

The use of hydrogen for aircraft propulsion in view of the fuel crisis. p0009 A73-35469

Economics and handling nuclear fuel systems for power reactors [CEA-CONF-1093] p0257 N69-27096

Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs p0087 N69-35240

Utility needs and reliability of operational fast breeder reactors p0087 N69-35243

Influence of volatile fuel components on vehicle emissions [BM-RI-7291] p0117 N70-20511

Petroleum products handbook - spark ignition piston, air breathing, jet, and diesel engine fuel systems [AD-698440] p0092 N70-23046

Feasibility analysis of various fuels for aircraft engines [AD-707178] p0016 N70-37672

Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TN-D-6404] p0096 N71-31456

Hydrocarbon fuels and fuel systems that meet cooling and propulsion requirements of advanced air breathing engines [AD-737372] p0100 N72-23806

Analysis of factors influencing technical feasibility of operating aircraft on liquid hydrogen fuel [NASA-TN-X-68242] p0021 N73-24777

FUEL TANKS

Technical reference manual for protective interior liners of petroleum fuel containers [AD-666969] p0263 N68-23614

Tankage systems for methane-fueled supersonic transport [NASA-TN-X-1591] p0081 N68-23895

FUEL TESTS

Soviet book on automotive and jet aircraft engine fuel chemical stabilizers under storage, transit and operational conditions, examining additives in relation to stability ratings p0073 A71-17433

Monaqueous fuel processing based uranium alloys and breeder reactor fuels [ANL-TRANS-704] p0084 N69-25563

Conversion of experimental turbojet combustor from ASTM A-1 fuel to natural gas fuel [NASA-TN-X-2241] p0094 N71-20533

Comparison of combustion characteristics of ASTM A-1, propane, and natural gas fuels in annular turbojet combustor [NASA-TN-D-7135] p0104 N73-16771

FUEL-AIR RATIO

Open cycle MHD generator operation, comparing below stoichiometric air-fuel ratios to excess air level p0166 A70-30534

Natural gas and hydrogen-natural gas mixtures as automotive fuels and relationship of emissions to air-fuel ratio [TPR-48] p0099 N72-18761

FUELS

Senate hearings on establishment of Commission on Fuels and Energy p0096 N71-30165

Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000 [NLL-TRANS-1166-(9022.9)] p0096 N71-35501

Coal gasification, gas purification, and catalytic methanation to produce high Btu automotive gas [TPR-49] p0099 N72-18760

Natural gas and hydrogen-natural gas mixtures as automotive fuels and relationship of emissions to air-fuel ratio [TPR-48] p0099 N72-18761

Congressional hearings concerning critical energy needs p0020 N73-17989

Review of resources of fossil and nuclear fuels, solar energy and hydroelectric power [LRP-63/73] p0021 N73-30975

Portable open cycle fuel cell power plant capable of operation on military fuels [AD-764285] p0254 N73-30979

Hydrogen and other synthetic fuels [TID-26136] p0118 N73-33738

FUNCTIONS (MATHEMATICS)

Electrode end effects on plane flow of electrically conducting fluid in MHD generator, determining current and electrical potential functions p0120 A68-16360

G

GALLIUM ARSENIDES

Type III-V gallium arsenide solar cells technological construction and electrical properties p0023 A68-15419

GaAs photoelectric devices for radiation detection and light to electric energy conversion, considering photoresistors, photodiodes and solar cells p0026 A69-27465

GaAs solar cells performance as function of doping levels, ascribing poor efficiencies to surface recombinations p0032 A70-21721

Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response p0039 A72-30225

High-efficiency Ga-1-x/Al-x/As-GaAs solar cells. p0040 A73-10132

Techniques for improving performance of gallium arsenide solar cells by ion implantation [NASA-CR-135510] p0068 N73-30977

GAMMA RAYS

Gamma ray logging in uranium prospecting [SM-112/15] p0084 N69-30790

Mixed fission products potential as thermal and gamma energy sources [BNWL-1115] p0224 N69-38506

GAS ANALYSIS

Pollutants from methane fueled gas turbine combustion. [ASME PAPER 72-WA/GT-3] p0075 A73-15867

GAS BEARINGS

Isotope Brayton space power systems and their technology. p0183 A73-20467

Design, fabrication, and stability testing of foil gas bearing test rig [NASA-CR-1563] p0231 N70-25623

GAS CHROMATOGRAPHY

Gas chromatography and mass spectrometry applied to porphyrin microanalysis, studying homologous porphyrin series in ancient sediments and oils p0073 A70-12516

Survey on organic geochemistry origins and use of gas-liquid chromatography and mass spectrometry analyses of organic components isolated from crude oils and sediments [NASA-CR-93111] p0079 N68-17316

GAS COOLED REACTORS

Reactivity effects caused by radial power flattening in gas cooled, fast-spectrum reactor [NASA-TN-D-4459] p0080 N68-19925

Fuel cycle costs for varying designs of gas cooled fast breeder reactors [GA-8032] p0081 N68-29161

Operation, research, and maintenance of gas coolant loops of Beqase nuclear fuel testing reactor [CEA-R-3564] p0221 N69-27494

Pulsed ionization chamber for plasma diagnostics, and applications to MHD electrical power generation from gas cooled reactors [AD-747681] p0250 N73-12800

GAS DENSITY

Combustion driven Hall configuration MHD generator, discussing boundary layer analysis, gas density nonuniformity and electrode drop p0168 A70-40003

GAS DISCHARGE TUBES

Direct current powered self repeating plasma accelerator with interconnected annular and linear discharge channels [NASA-CASE-ILA-03103] p0240 N71-21693

GAS DISCHARGES

Argon discharges in metal capillary cathodes noting effects of electron density, flow velocity, electrode phenomena and gas temperature p0143 A69-23450

Russian book - Physical bases of thermionic energy conversion. p0190 A73-41876

Emission characteristics of refractories and magnetic field influence on current distribution along electrodes - MHD generators [SM-74/92] p0210 N69-13319

GAS DYNAMICS

Two terminal operation of diagonal conducting wall and Hall generators under identical gas dynamic channel entrance conditions and magnetic field configurations p0127 A68-23920

Two terminal operation of diagonal connecting wall /DCW/ and Hall MHD generators under identical gasdynamic channel entrance conditions and magnetic field configurations p0132 A68-39717

Electroquasidynamic energy converter load current analysis, deriving expression for space charge electric field with axially varying or constant charge distribution p0165 A70-25036

EGD energy converter system geometries for maximum power efficiencies, comparing slender conversion channels, abrupt expansion, free jet and divergent for operating characteristics p0167 A70-30536

Axial pressure, electric current and potential distribution in two-phase particulate electroquasidynamic flow, discussing space charge electric field effect p0170 A70-40257

Gas dynamics of supersonic radial nozzles for magnetohydrodynamic generators [FTD-MT-24-208-67] p0206 N68-35663

Principles of operating magnetohydrodynamic power generators p0229 N70-18728

Electrical parameters in Faraday-type MHD generator with nonuniform gas properties in electric field direction [INR-1096] p0235 N70-33672

GAS FLOW

Optimization of linear conduction MHD generator with constant cross sectional area channel p0130 A68-30712

Self regenerating molten seed electrodes for open cycle MHD power generators longevity, regulating combustion chamber and gas flow seeding p0178 A72-18336

Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity p0185 A73-23473

Qualitative analysis of MHD energy conversion efficiency p0186 A73-27321

Research and advanced concepts - laminarization in nozzle flow, liquid metal magnetohydrodynamic power conversion, swirling and nonswirling gas flow, magnetic field effects in square channel p0207 N68-37410

Numerical calculations of electrical parameters in Faraday-type MHD generator with two dimensional gas flow [INR-1199] p0241 N71-27207

GAS GENERATORS

Electroquasidynamic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures p0165 A70-27330

- Electrostatic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures p0170 A70-42071
- Ionization turbulence effect on nonequilibrium plasma MHD generator performance, using I-V characteristics equation p0179 A72-29358
- Design of fuel cells, hydrogen generator, power plant for indirect hydrocarbon-air systems [PWA-3211] p0200 N68-20884
- Design of hydrogen generating fuel cell [AD-733931] p0118 N72-18520
- GAS HEATING**
- Catalytic and thermal reforming of gaseous hydrocarbons with steam into town gas [NASA-TT-F-13668] p0095 N71-28159
- GAS INJECTION**
- Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition p0190 A73-39619
- GAS IONIZATION**
- Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc p0165 A70-25525
- Preionization in Cs seeded Ar nonequilibrium plasma for MHD generators, examining discharge characteristics, recombination reactions, etc p0168 A70-39991
- Magnetohydrodynamic generators with unbalanced conductivity and ionization instability [FTD-MT-24-205-67] p0206 N68-35442
- Research program to determine bulk properties of plasmas in MHD disk generator driven by high temperature, large mass flow, alkali shock tunnel [AD-694529] p0228 N70-15650
- GAS LASERS**
- Laser energy absorption by plasma for controlled thermonuclear fusion, comparing uses of electrically pumped gas, chemical and solid state lasers p0187 A73-35379
- GAS MIXTURES**
- Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties p0169 A70-40012
- Brayton cycle power conversion system using He-Xe gas mixture, discussing compressor net engine and turbine static efficiencies p0175 A71-38908
- Dielectric strength of gas mixtures for electrofluid dynamic generators p0216 N69-18444
- Natural gas and hydrogen-natural gas mixtures as automotive fuels and relationship of emissions to air-fuel ratio [TPR-48] p0099 N72-18761
- GAS REACTORS**
- Gas core reactors and MHD generator to solve problems of growing demand for electric power without thermal pollution p0243 N71-33664
- GAS TEMPERATURE**
- Combustion products thermodynamic parameters for natural gas burning in oxygen atmosphere, plotting gas temperature and flow rates against pressure and excess oxidant ratio p0075 A72-29451
- GAS TRANSPORT**
- Oxygen electrodes for fuel cells, and mechanism in transport of oxygen near line separating gas electrolyte electrode p0200 N68-18025
- GAS TURBINE ENGINES**
- Aircraft and industrial gas turbine fuel requirements and properties noting costs p0071 A68-35741
- Fluorocarbon fluid Rankine cycle system utilizing gas turbine exhaust heat for environmental control [SAE PAPER 700160] p0165 A70-25371
- Two stage gas turbine engine optimal tuning for RPM, thrust, fuel rate and gas temperature, describing automated bench tests p0170 A70-43361
- Computerized calculation of gas turbine cycles thermal efficiency, using hydrocarbon fuel, considering fuel composition and heat of combustion changes p0073 A70-43439
- High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature p0172 A71-24218
- Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination p0074 A71-28754
- Soviet civil gas turbine engines construction and performance, noting relatively high specific fuel consumption p0178 A72-21275
- Liquid metal regenerator design and test evaluation for gas turbine engine fuel consumption improvement [ASME PAPER 72-GT-33] p0178 A72-25629
- Pollutants from methane fueled gas turbine combustion. [ASME PAPER 72-WA/GT-3] p0075 A73-15867
- Isotope Brayton space power systems and their technology. p0183 A73-20467
- Ceramics replacement for Ni-Cr superalloys to improve automotive gas turbine performance by increasing inlet temperature, considering material selection p0187 A73-31250
- Market trends and technical progress in small gas turbine engines for general aviation and executive aircraft and helicopters p0187 A73-34447
- Noise reduction modifications in JT3D and JT8D gas turbine engine by single stage fan replacements [SAE PAPER 730346] p0187 A73-34694
- Gas turbine engine principles, performance improvements, and application to electric power generation based on NASA technology p0208 N69-12578
- Advanced propulsion system effect on future rotary wing aircraft design p0218 N69-23996
- Aerodynamic problems in cooled turbine blading design for small gas turbine engines p0220 N69-26532
- GAS TURBINES**
- Materials and cooling of aircraft gas turbine engines noting nickel and tantalum alloys, turbine inlet temperatures, coatings, etc p0122 A68-19791
- Heat transfer research review, discussing gas turbines, aeronautics, astronautics, nuclear power, thermal pollution and controlled fusion challenges p0178 A72-23684
- Liquid or solid propellant hot gas turbines as power source for hydraulic and electrical energy p0181 A72-36558
- Determining economic effectiveness of optimum nonregenerative gas turbines [AD-683130] p0013 N69-26227
- State of the art in gas turbine design for automobile application [PUBL-18] p0227 N70-13927
- Turbine performance in gas-bearing Brayton cycle turboalternator [NASA-TN-D-5604] p0227 N70-14220
- Automobile gas turbine engine design [AD-694842] p0227 N70-14488
- Systems model used to determine dynamic behavior of nuclear closed cycle, gas turbine plant with high temperature reactor [NLL-WH-TRANS-271-/9091.9F/1] p0230 N70-21100
- Gas turbine power plants in future urban energy planning [FE-439J] p0253 N73-22912
- GAS VISCOSITY**
- Performance characteristics of electrofluid dynamic energy conversion processes, using viscous coupling between neutral molecules and electrically charged particles [AGARDGRAPH 81] p0124 A68-22535

GASEOUS DIFFUSION

- Environmental radiation and concentration levels
of atomic gaseous diffusion plant
[GAT-553] p0010 N68-25106
Coal enrichment wastes suitable for extraction of
fuel gas p0116 N70-10884

GASEOUS FISSION REACTORS

- Gaseous nuclear fuel for gas reactors and
magnetohydrodynamic plants
[JPRS-55126] p0247 N72-17956

GASES

- Comparison of ASTM-A1 liquid fuel and natural gas
fuels in annular turbojet combustor at Mach 3
[NASA-TN-X-52700] p0087 N70-12102
Management planning in Sweden for natural gas as
industrial energy source p0096 N71-30522
[IVA-MEDD-167]
Statistical analysis of world reserves of solid
fuel, crude oil, uranium, and natural gas in
year 2000 p0096 N71-35501
[NLI-TRANS-1166-(9022.9)]
Coal gasification, gas purification, and catalytic
methanation to produce high Btu automotive gas
[TPR-49] p0099 N72-18760
Technologies for production and utilization of
petroleum, natural gas, oil shale and coal
[BM-IC-8612] p0111 N73-30335

GASOLINE

- Commercial aviation gasolines inspection data
tabulated and compared for 1969 and 1964
[SAE PAPER 700228] p0073 A70-25897
Influence of volatile fuel components on vehicle
emissions p0117 N70-20511
[BM-RI-7291]
Comparative emissions from leaded and prototype
lead free automobile fuels p0092 N70-28685
[BMRI-7390]
Senate subcommittee hearings on air and water
pollution, including data on air quality
standards and gasoline additive developments
p0016 N70-41771
Alternate fuels to reduce aircraft exhaust
pollutants p0106 N73-20815
[AD-755151]
Congressional hearings on causes and implications
of impending shortages of gasoline, heating oil,
diesel fuel, jet fuel, and electricity
p0022 N73-33928

GELATION

- Research on sol-gel stimulated by results on
thorium and interest in fast reactor fuels
[RT/CHI/68/28] p0082 N69-11048

GELLED PROPELLANTS

- Economics of using gelled fuels in commercial jet
transport p0093 N70-34002
[FAA-NA-70-45]

GEOCHEMISTRY

- Advances in organic geochemistry 1971; Proceedings
of the Fifth International Meeting, Hanover,
West Germany, September 7-10, 1971. p0076 A73-25459
Survey on organic geochemistry origins and use of
gas-liquid chromatography and mass spectrometry
analyses of organic components isolated from
crude oils and sediments p0079 N68-17316
[NASA-CR-93111]

GEODETIC SATELLITES

- Accurate localization by the Geole Project satellite
p0075 A73-17192

GEOELECTRICITY

- Energy conversion and electric power plants for
developing countries p0093 N70-38878

GEOGRAPHIC APPLICATIONS PROGRAM

- Geographic applications of ERTS-1 imagery to rural
landscape change in Tennessee p0103 N73-14343
[E72-10355]

GEOGRAPHY

- Geographic analysis and mapping of landscape
changes in Tennessee from ERTS-1 imagery
[E73-10661] p0108 N73-25357

GEOLOGICAL FAULTS

- Application of ERTS-1 imagery to fracture related
mine safety hazards in coal mining industry in
Indiana p0102 N73-10372
[E72-10193]

- Application of ERTS-1 imagery to fracture related
mine safety hazards in coal mining industry in
Indiana and Illinois p0105 N73-18321
[E73-10096]

- Application of ERTS-1 imagery to study of
fracture-related safety hazards in Indiana coal
mining industry p0111 N73-30311
[E73-10970]

- Application of ERTS-1 imagery to fracture-related
mine safety hazards in Ohio coal mining industry
[E73-11034] p0112 N73-31338

GEOLOGICAL SURVEYS

- Geological analysis of aerial thermography of the
Canary Islands, Spain. p0077 A73-39896

- Analysis of ERTS-1 imagery of Northern Coast
Ranges and Sacramento Valley, California for
locating mercury deposits and oil and gas fields
[PAPER-G18] p0109 N73-28249

- Application of ERTS-1 imagery to determine
geological evidence of mineral and hydrocarbon
accumulations in Alaska, Canada, Montana,
Colorado, New Mexico, and Texas p0109 N73-28261
[PAPER-G30]

GEOLOGY

- Gemini space photography applications in petroleum
industry, especially for geologists involved in
regional mapping or modern environmental research
p0071 A68-30437

- Gravimetric surveys of Monzhukly structure in
relation to oil and gas deposits p0078 N68-10240
[ACIC-TC-1217]

- Exploratory geology and use of seismology in
petroleum industry p0079 N68-17606

- Seismic wave propagation used in prospecting for
oil fields and minerals p0080 N68-17607

- Satellite-aircraft approach to oil detection and
rock identification in North and South America
[NASA-CR-101384] p0084 N69-28160

- Geologic data acquisition from space-borne
photography p0088 N70-14088

- Geological mapping of New York State based on
ERTS-A imagery p0101 N72-29272
[E72-10020]

- Recent Soviet investigations in geothermy
[AD-750128] p0104 N73-15454

- Physical interpretation of geology, hydrology, and
glaciology revealed by ERTS-1 imagery of east
central Ohio p0106 N73-20413
[E73-10454]

- Commercial application of ERTS-1 imagery in
structural reconnaissance for minerals and
petroleum p0108 N73-25392
[E73-10700]

- ERTS-1 imagery of Namafjall geothermal area, Iceland
[E73-10874] p0111 N73-29225

GEORETEY

- High temperature solar energy converter cavity
absorbers geometry, considering absorption
parameters of radiation reflected by concentrator
p0030 A70-10761

GEOMORPHOLOGY

- Geophysical survey of continental shelves off
African coast and mapping for oil potential
[PB-211393] p0103 N73-14400

GEOPHYSICS

- Nuclear geophysical techniques and spectral
analysis in oil field exploitation and lithology
[SM-112/24] p0084 N69-30799

- Combined nuclear geophysical methods in oil
geology for surface rock analysis of moon and
planets p0085 N69-30800
[SM-112/25]

- Geophysical survey of continental shelves off
African coast and mapping for oil potential
[PB-211393] p0103 N73-14400

- Commercial application of ERTS-1 imagery in
structural reconnaissance for minerals and
petroleum p0108 N73-25392
[E73-10700]

- ERTS-1 imagery of Namafjall geothermal area, Iceland
[E73-10874] p0111 N73-29225

- Space applications research in astronomy and earth
physics p0021 N73-31867
[NASA-SP-331]

GEORGIA

SUBJECT INDEX

GEORGIA

ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386

GEOTHERMAL RESOURCES

Bibliography on geothermal prospecting in arid and semiarid lands
[PB-218830/8] p0109 N73-27359
ERTS-1 imagery of Hwasfall geothermal area, Iceland
[E73-10874] p0111 N73-29225

GERMANIUM ALLOYS

Thermoelectric and mechanical performance of silicon-germanium solar thermoelectric generator
[NASA-CR-72340] p0046 N68-12252

GERMANIUM COMPOUNDS

Parametric analysis of radioisotope cascaded thermoelectric generators with Si-Ge first stage and PbTe second stage
[NASA-TN-X-1501] p0192 N68-14585
Effective volume power density analysis for radioisotope power generator with silicon germanium thermoelectric elements
[NASA-TN-X-1453] p0193 N68-14630

GERMANIUM DIODES

Germanium solar photoelectric cells for high intensity solar energy conversion devices
p0050 N68-28746

GERMANY

Nuclear fuel requirements and costs of reactors in Germany /supplement/
[KFK-466] p0081 N68-22608

GIBBS-HELMHOLTZ EQUATIONS

Reversible thermodynamic cycle of chemical to electric energy conversion with electron gas as working body, discussing Gibbs-Helmholtz equations
p0180 A72-32994

GLACIOLOGY

Physical interpretation of geology, hydrology, and glaciology revealed by ERTS-1 imagery of east central Ohio
[E73-10454] p0106 N73-20413

GLASS COATINGS

Selective glass coatings applications in solar thermoelectric generators working without radiation concentrators
p0031 A70-10767

GLIDERS

Flight range and fuel consumption formulas of power gliders used for transportation compared with automobiles
p0073 A69-43142

GLOW DISCHARGES

Hollow cathode operation and plasma discharge in mercury ion engine, potential distribution of glow discharge, and liquid metal MHD power conversion
p0214 N69-16485

GOLD

Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination
p0027 A69-35679

GRANITE

Sierra Nevada granite halos in biotite nuclei, discussing relation between biotite zircon content and halo production
p0071 A68-23286

GRAPHITE

Equilibrium fuel cycle costs for low-enriched, unclad, helium cooled, uranium oxide graphite reactor
[ORNL-TM-1789] p0078 N68-12420

GRAPHS (CHARTS)

Signed digraphs for forecasting energy demands and analyzing policies for meeting environmental constraints on energy use
[R-756-NSF] p0018 N72-20948

GRAVIMETRY

Gravimetric surveys of Monzhukly structure in relation to oil and gas deposits
[ACIC-TC-1217] p0078 N68-10240

GRAVITATION

Oil slick spreading on calm sea due to force of gravity and surface tension of water
p0257 N70-10537

GREENLAND

Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics
p0084 N69-30776

GRIDS

Passive circuit grids for stabilization of magnetohydrodynamic generator plasma
[TH-72-E-31] p0253 N73-23757

GROUND EFFECT MACHINES

Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions
[AIAA PAPER 70-1221] p0008 A71-22779

Power plants, cost estimates, freighter missions, commercial feasibility and technology for nuclear air cushion vehicles
p0187 A73-32194

Nuclear power plants based on nuclear aircraft technology to power ocean-going air cushion vehicles
[NASA-TN-X-1871] p0013 N69-35723

Air-cushion tankers for transporting Alaskan North Slope oil
[NASA-TN-X-2683] p0258 N73-18981

GROUND STATIONS

Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth
p0035 A71-28671

Cost goals for silicon solar arrays for large scale terrestrial applications.
p0041 A73-14250

Technological evolution of solar generators for terrestrial applications and sounding balloons, discussing environment caused problems and solutions, energy cost estimate and future prospects
p0042 A73-14253

GROWTH

Microorganism growth with petroleum fuels
[AD-680804] p0083 N69-20205

H

HALL ACCELERATORS

Nonuniform current distribution effect on segmented electrode Hall MHD generators and accelerators
p0126 A68-23914

Hall type electromagnetic plasma accelerator, with thrust affected only by Lorentz forces in external magnetic field, compared to pure Hall accelerator
p0146 A69-25214

Experimental and analytical comparison for 20 MW combustion-driven Hall configuration MHD generator
[ER-344] p0231 N70-24132

HALL EFFECT

Closed cycle MHD experimental facility characteristics, discussing seeding, Faraday and Hall voltage measurements and plasma conductivity
p0127 A68-23929

Electrical conductivity tensor effect on ionized gas flow in MHD generator with finite electrodes, discussing Hall current effect
p0130 A68-29598

Hall voltage reduction in linear MHD generators noting Lorentz force effect
p0133 A68-39722

Constant velocity Hall type MHD generators, analyzing steady state operating characteristics and stability
p0138 A68-43068

MHD generator two dimensional analysis for studying edge effect, taking into account Hall effect
p0140 A69-14099

Turbulent plasma near stability limit in MHD generator with constant load coefficients, noting effective conductivity and effects of gas temperature
p0144 A69-23460

Linear nonequilibrium MHD generator operating at Mach 2 and Hall parameter of 3 using cesium seeded helium as working fluid
p0144 A69-23471

SUBJECT INDEX

HEAT GENERATION

- Large disk MHD generator operating at high Hall coefficient and driven by cesium seeded argon or molecular gases p0144 A69-23473
- Critical Hall parameter indicating instability in alkali-seeded noble gases in nonequilibrium MHD generators [AIAA PAPER 70-40] p0163 A70-18107
- Transverse current leakage effect on energy conversion and Hall characteristics of MHD generator p0171 A71-12195
- Effect of heterogeneity and Hall current on the MHD power generator. p0182 A73-10434
- Hall current effects in the Lewis magnetohydrodynamic generator. p0184 A73-22823
- Hall effect in MHD channels with segmented electrodes [SM-74/248] p0213 N69-13352
- Hall converter for space charge neutralized electrofluid dynamic energy converter p0216 N69-18450
- Hall magnetohydrodynamic generators instability to magnetoacoustic waves [RR-323] p0217 N69-21275
- Gas velocity and temperature distribution effects on electrical parameters of Faraday-type MHD generator [INR-1095] p0235 N70-33547
- HALL GENERATORS**
- Continuous electrode Faraday diagonal conducting wall and Hall MHD accelerators and generators performance characteristics p0119 A68-12258
- Nonuniform current distribution effect on segmented electrode Hall MHD generators and accelerators p0126 A68-23914
- Operation of 20 Mw Hall MHD generator and associated equipment, noting safety precautions and devices p0127 A68-23919
- Two terminal operation of diagonal conducting wall and Hall generators under identical gas dynamic channel entrance conditions and magnetic field configurations p0127 A68-23920
- Arc driven Hall MHD generator performance at strong MHD interaction parameters, noting channel stall as power limiting effects p0127 A68-23921
- Two terminal operation of diagonal conducting wall /DCW/ and Hall MHD generators under identical gasdynamic channel entrance conditions and magnetic field configurations p0132 A68-39717
- Combustion driven Hall configuration MHD generator, discussing boundary layer analysis, gas density nonuniformity and electrode drop p0168 A70-40003
- Performance comparison of diagonal conducting wall MHD generator and Hall generator of equal dimensions, investigating wall temperature effect p0169 A70-40004
- Optimal load circuits number for maximum power extraction from Hall MHD generator with nonuniform gas flow along channel p0170 A70-44900
- Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output p0172 A71-23441
- Nonequilibrium ionization in magnetohydrodynamic conversion generators p0186 A73-28071
- Plasma flow in duct of series MHD generator [SM-74/225] p0212 N69-13339
- Current distribution of segmented Hall generator [AD-705160] p0234 N70-32778
- Diagonal conducting wall generator and Hall generator performance [AD-705159] p0235 N70-32986
- HANDBOOKS**
- Silicon solar cell design, describing handbook organization and derivation of design curves and data tables p0040 A73-14209
- Petroleum products handbook - spark ignition piston, air breathing, jet, and diesel engine fuel systems p0092 N70-23046 [AD-698440]
- Petroleum products handbook - fuel additives, antiknock, storage, corrosion, motor oils, and boiler fuels [AD-698546] p0092 N70-23047
- Petroleum products handbook - drive-train oils, lubricating oils for aircraft gas turbine engines, industrial and insulating oils [AD-698547] p0092 N70-23048
- Petroleum products handbook - oil additives, viscosity, antioxidants, anticorrosion, detergents, antifoams, and lubricants [AD-698548] p0092 N70-23049
- Failure data handbook for nuclear power facilities - failure category identification and glossary [LMBC-MEMO-69-7-VOL-2] p0234 N70-31812
- HARMONIC GENERATIONS**
- High power giant pulse YAG laser using nonlinear material to achieve complete second harmonic conversion in intracavity experiment p0163 A70-16470
- HARMONICS**
- Higher spatial harmonics of magnetic field in induction magnetohydrodynamic generator p0194 N68-16289
- HARTMANN FLOW**
- Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics [AFOSR-68-0859] p0202 N68-26537
- HAZARDS**
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry [E72-10064] p0102 N72-32336
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E72-10193] p0102 N73-10372
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois [E73-10371] p0105 N73-19366
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E73-10776] p0108 N73-27252
- Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining [E73-10802] p0109 N73-27277
- Application of ERTS-1 imagery to study of fracture-related safety hazards in Indiana coal mining industry [E73-10970] p0111 N73-30311
- HEAT EXCHANGERS**
- Hydrogen resistojet design and testing with Re heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer [AIAA PAPER 72-449] p0115 A72-26186
- Jet compression role in high temperature mechanical energy conversion heat exchanger based on ejector principle p0179 A72-27724
- Isotope Brayton space power systems and their technology. p0183 A73-20467
- Mechanical heat engines as energy conversion devices for space power generation p0228 N70-16221
- HEAT FLUX**
- Mathematical model of solar collection limitations for dynamic converters p0047 N68-17795
- HEAT GENERATION**
- Ecological significance of utilization of waste heat generated by rubbish combustion, industrial furnaces, electrical fixtures and human beings p0071 A68-21940
- Nuclear power plants for low cost heat and electricity generation p0014 N70-14505

HEAT MEASUREMENT

SUBJECT INDEX

HEAT MEASUREMENT

Calorimetric efficiency of cone and column solar energy concentrator
[NASA-TN-D-5109] p0053 N69-21088

Calorimetric evaluation of three 1.5-meter diameter inflatable rigidized solar concentrators for solar dynamic cycle power systems
[NASA-TN-D-5234] p0054 N69-28123

HEAT OF COMBUSTION

Computerized calculation of gas turbine cycles thermal efficiency, using hydrocarbon fuel, considering fuel composition and heat of combustion changes
p0073 A70-43439

HEAT OF SOLUTION

Thermal energy storage by utilizing heats of fusion for suitable materials
p0263 N68-17798

HEAT PIPES

High power linear beam tube devices for space power generation station, considering use of klystron with heat pipes for low weight and high efficiency
p0035 A71-28669

Cumulative bibliography of research and development projects conducted on heat pipe technology and applications
[NASA-CR-135953] p0258 N73-33900

Bibliography of research projects on heat pipe, development, performance, and application - January through March, 1972
[NASA-CR-135956] p0258 N73-33901

Bibliography of heat pipe research and development projects conducted during April through June 1972
[NASA-CR-135955] p0259 N73-33902

Bibliography of heat pipe research and development projects conducted during July through September, 1972
[NASA-CR-135952] p0259 N73-33903

Supplemental report and bibliographies of heat pipe research projects conducted during calendar year 1971
[NASA-CR-135951] p0259 N73-33904

HEAT PUMPS

Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion
p0138 A68-42954

HEAT RADIATORS

Energy source, power conversion, heat rejection and power conditioning and distribution subsystems constituting secondary power conversion systems
p0129 A68-29145

Comparison of load-bearing conical nonload-bearing panel heat radiators for potassium Rankine nuclear power plant
[NASA-CR-72307] p0190 N68-10050

Radiator design criteria for dynamic converters in which working fluids are condensed directly in radiator tubes
p0195 N68-17796

Rankine cycle low power turbocompressor for space applications
p0196 N68-17799

HEAT SINKS

Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials
[ICAS PAPER 70-16] p0115 A70-44127

Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0073 A71-24852

Six converter solar thermionic generator
[NASA-CR-92586] p0046 N68-15766

HEAT SOURCES

Radioisotope power subsystems for space, examining performance, heat source design, power conversion methods and efficiencies
p0119 A68-10231

Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control
[AIAA PAPER 68-122] p0120 A68-17540

Chemical power conversion to mechanical or electrical energy noting relation to temperature limits of heat for heat engine
p0123 A68-20734

Radioisotope heater as heat source for maintaining silver-zinc battery temperatures in low ambient environment
p0261 A68-25659

Thermal cells stressing lithium anode cells with various cathodes in eutectic electrolyte, discussing inorganic separators compatibility
p0261 A68-42515

SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
p0137 A68-42528

SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times
p0155 A69-29191

Spacecraft nuclear power source optimization, considering radioisotope and reactor heat sources, cryogenic cooler cycle types and spacecraft design
p0184 A73-22799

Development of a plutonium-fueled miniature power supply based on thermionic conversion.
p0186 A73-26028

Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources.
p0188 A73-38389

The multi-hundred watt RTG - Technology background and flight systems program.
p0189 A73-38418

Multihundred watt radioisotope thermoelectric generator design for on-pad and orbital conditions, discussing configurations, Pu-238 heat source and operating characteristics
p0189 A73-38419

Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection
p0189 A73-38422

Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427

Curium 244 heat source design for multihundred watt radioisotope thermoelectric generator with Si-Ge thermocouples for energy conversion, noting low cost
p0077 A73-38429

Radioactive isotopes as sources of heat and radiation with applications for spacecraft power and propulsion and terrestrial uses in SNAP
p0082 N68-30262

Criticality calculations for plutonium oxide radioisotope heat source
[BLM-1532] p0082 N69-15081

Cobalt oxide and cobalt oxide-magnesium oxide solutions for cobalt isotope power and heat source
[DP-1192-1] p0086 N69-31541

Preliminary design and performance considerations for 25 kW Pu 238 heat source Isotope Reentry Vehicle
[NASA-CR-72555] p0223 N69-34989

Helium release from plutonium-238 dioxide fuels for radioisotope thermoelectric generator heat sources
[SC-RR-69-662] p0091 N70-21251

Heat transfer problems of earth buried space radioisotope heat sources
[SORIN-T/601] p0091 N70-21969

Strontium 90 heat source production, including purification, transportation, fuel form preparation, densification, and encapsulation
[ORNL-IIC-36] p0096 N71-35815

Production, purification, and conditioning of Ac-227 and development of isotopic heat source fueled with Ac-203
[A/CONF-49/P/287] p0098 N72-16196

Thermally cascaded thermoelectric generator with radioisotopic heat source
[NASA-CASE-NPO-10753] p0247 N72-26031

- Recent Soviet investigations in geothermy
[AD-750128] p0104 N73-15454
- Design of prototype thermal battery incorporating
pelletized alkaline heat source
[SC-RR-69-497-A] p0267 N73-21084
- Deep-seated thermal processes, social-economic
heat utilization, and geothermal observation
improvement
[JPRS-59496] p0109 N73-27324
- HEAT STORAGE**
- Thermal cells stressing lithium anode cells with
various cathodes in eutectic electrolyte,
discussing inorganic separators compatibility
p0261 A68-42515
- Solar energy storage optimization for satellite
and space vehicle power systems, discussing
thermal collection in heat sinks and electric
batteries
p0261 A68-43812
- Orbital mission solar energy power conversion
system, discussing heat transfer processes for
storage feasibility
p0033 A70-41852
- Feasibility of thermal energy storage and solar
heating as means of conservation and more
efficient utilization of electric power
[PB-210359] p0065 N73-10976
- HEAT TRANSFER**
- Medium temperature fuel cells advantages including
improved electrochemical reaction kinetics,
water and heat removal
p0156 A69-32417
- Organic Rankine cycle system using heat absorption
from turbine exhaust to provide increased
electrical output and to power air conditioning
p0162 A69-42267
- Thermal steady state characterization of isotec
radioisotope thermoelectric generator,
discussing design features and heat transfer
models for operating temperatures and output
performance
[ASME PAPER 69-WA/ENER-12] p0163 A70-14897
- Orbital mission solar energy power conversion
system, discussing heat transfer processes for
storage feasibility
p0033 A70-41852
- Heat losses in oil wells hot liquid injections,
modifying Groveanu approximation method for
exact solution
p0074 A72-15743
- Heat transfer research review, discussing gas
turbines, aeronautics, astronautics, nuclear
power, thermal pollution and controlled fusion
challenges
p0178 A72-23684
- Heat transfer limitations in dynamic energy
conversion systems for space power plants
p0195 N68-17797
- Theoretical analysis and experimental verification
of two phase heat transfer characteristics of
combined solar collector-ammonia generator for
solar air conditioner
p0053 N69-17227
- Heat transfer from radioisotope capsules buried in
porous materials
[AD-691213] p0225 N69-40031
- Artificial circulation system for heat transfer
from subsurface porous layers by underground
boilers
p0089 N70-16585
- Differential equations for calculating factors
causing spontaneous combustion in coal seams
p0090 N70-16595
- Heat transfer problems of earth buried space
radioisotope heat sources
[SORIN-T/601] p0091 N70-21969
- Methane or hydrogen fuel direct cooling of first
stage stator of SST aircraft turbine - numerical
heat transfer analysis
[NASA-TN-D-6042] p0117 N70-42326
- Design, development, and operation of compact,
high performance, magnetohydrodynamic generators
[AD-756489] p0253 N73-23765
- HEAT TRANSMISSION**
- Geothermal energy extraction from hot rocks via
deep dry wells by pressurized water circulation,
solving numerically fluid flow, heat transport
and rock fracture equations
p0075 A73-16382
- Filtration of heat carriers in earth core rocks at
depths from 6 to 8 kilometers
p0090 N70-16588
- Pressure effects on filtration and permeability of
heat carriers in earth core rocks
p0090 N70-16589
- HEATING**
- Solar reflector mathematical model for studying
interface between collector and heat receiver,
noting error in cavity emitted radiation
directional assumption
[AGARDOGRAPH 81] p0024 A68-22516
- Thermodynamic cycle and optimum conditions of
electric power source of MHD generator in
combination with thermocompressor
p0142 A69-21592
- Energy conversion with liquid metal working fluids
in MHD generators, discussing single stage fully
Carnotized process
p0147 A69-27482
- Nuclear power plant energy for heating urban center
p0227 N70-14518
- Problems of room heating in summer - suitable
building materials
p0059 N70-30560
- HEATING EQUIPMENT**
- Improved technology for multiwatt radioisotope
heater units.
p0188 A73-36681
- Rod heater with indirect resistance heating for
simulation of nuclear fuel rods
[KFK-894] p0230 N70-22247
- Thermoelectric and ventilating system designs for
use in protective military clothing
[AD-737720] p0247 N72-24139
- Technical and economic feasibility of solar
powered space heating, air conditioning, and hot
water heating systems for residential applications
[NASA-CR-124063] p0066 N73-17911
- HELICAL WINDINGS**
- Optimal, elliptic and circular windings for
superconducting nonferrous magnetic MHD
generators, comparing cross sections
p0185 A73-24594
- HELICOPTER ENGINES**
- Helicopter propulsion systems using closed cycle
working fluid
p0218 N69-23998
- HELIOS PROJECT**
- Design and performance of solar array for Helios
solar probe
[DGLR-PAPER-72-091] p0066 N73-15084
- HELIUM**
- Brayton cycle power conversion system using He-Xe
gas mixture, discussing compressor net engine
and turbine static efficiencies
p0175 A71-38908
- Performance of helium seeded with uranium in
magnetohydrodynamic generator
p0243 N71-33663
- HELIUM ISOTOPES**
- Nuclear seeded magnetohydrodynamic plasmas for
electron kinetics using helium 3
[AD-690542] p0225 N69-39863
- HELIUM PLASMA**
- Diluent gas effect on alkali metal seeded rare gas
nonequilibrium plasmas conductivity at various
pressures, noting working fluid suitability in
MHD generators
p0123 A68-20829
- Electric conductivity in argon potassium and
helium potassium plasmas with elevated electron
temperature in crossed electric and magnetic
fields
[IPP-3/59] p0190 N68-10892
- HEOS A SATELLITE**
- Design of ESRO 1, ESRO 2, and HEOS A power systems
and control equipment
[ESRO-TN-83] p0057 N70-17621
- HERMETIC SEALS**
- Mechanical energy storage by flywheel with
magnetic fluid hermetic seal and bearing, using
anisotropic and whisker materials
p0263 A73-25979
- HETEROGENEITY**
- Effect of heterogeneity and Hall current on the
MHD power generator.
p0182 A73-10434

HIGH ENERGY ELECTRONS

Electron screening effects on thermonuclear reactions under high densities
[ITF-69-7] p0223 N69-34199

HIGH FIELD MAGNETS

Large superconducting magnets for MHD power plants, discussing scale-up requirements, cryogenic system, stable operation margin and emergency system shutdown
p0122 A68-20175

HIGH PRESSURE OXYGEN

Cost estimates of oxygen blast enrichment of lignite during gasification
p0117 N70-10885

HIGH TEMPERATURE

High temperature fuel cell with thin disk solid electrolyte, evaluating performance as function of electrolyte, electrode and current collector resistance ratio
p0170 A70-42499

Development of isotopic power fuels for use at temperatures up to 2000°C
[ORNL-4750] p0109 N72-24703

HIGH TEMPERATURE ENVIRONMENTS

High temperature and vacuum solar furnace processing of refractory metals in space or on moon
p0039 A72-37675

High temperature material limitations in thermoelectric energy conversion
p0198 N68-17820

Characteristics and application of high temperature fuel cells as power sources
[AD-727497] p0244 N71-37624

HIGH TEMPERATURE GASES

Liquid or solid propellant hot gas turbines as power source for hydraulic and electrical energy
p0181 A72-36558

High temperature zirconium dioxide electrolyte fuel cell systems design and operation with methane or gasoline as fuel, evaluating performance characteristics
p0182 A73-15118

HIGH TEMPERATURE NUCLEAR REACTORS

Thermionic generator space power system using solar energy thermionic /SEI/ diode array and incandescent radioisotope fuel block radiant heat source
p0128 A68-24403

System and facility for generating electricity and gas from lignite using high temperature nuclear reactor
[JUL-554-R6] p0264 N69-13298

Costs and flow charts for thorium and uranium recovery from HTGR fuel elements containing silicon carbide coated fissile and fertile particles
[GAMD-8661] p0083 N69-17117

Systems model used to determine dynamic behavior of nuclear closed cycle, gas turbine plant with high temperature reactor
[NLL-WH-TRANS-271-/9091.9F/] p0230 N70-21100

High temperature reactor design
[TRG-1996] p0093 N70-37284

HIGH TEMPERATURE PLASMAS

High temperature plasmas and attempts to achieve controlled thermonuclear fusion, discussing plasma properties
p0132 A68-38740

Nuclear fusion reactor development, discussing magnetic field confinement of hot dense plasmas and electric power production economic possibilities
p0142 A69-20124

High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters
[NASA-TT-F-11825] p0205 N68-30811

Research program to determine bulk properties of plasmas in MHD disk generator driven by high temperature, large mass flow, alkali shock tunnel
[AD-694529] p0228 N70-15650

HIGH TEMPERATURE RESEARCH

High temperature solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using solar furnace
p0032 A70-30907

Thermodynamic characteristics of high temperature open cycles
[SM-74/235] p0212 N69-13345

HIGH TEMPERATURE TESTS

Cubic stabilized zirconia utilization as solid electrolyte in high temperature fuel cell system for efficient and economical energy conversion
p0263 A72-33894

HIGH THRUST

Civil aircraft future propulsion requirements, considering larger engine sizes, higher takeoff thrusts and lower noise levels
[CASI PAPER 72/10] p0174 A71-37600

HIGH VOLTAGES

Integrated high voltage CdS solar batteries with interconnected cells in series without grid
p0034 A71-16058

Concept for a high voltage solar array with integral power conditioning.
p0044 A73-26091

High voltage generation with beta electrogenerator cell
[NASA-TM-X-527761] p0232 N70-26116

HILBERT TRANSFORMATION

Hall effect in MHD channels with segmented electrodes
[SM-74/248] p0213 N69-13352

HONEYCOMB STRUCTURES

Titanium alloy honeycomb with blackened walls as absorber of solar energy
[NASA-TM-D-4727] p0050 N68-30751

Thermodynamics of honeycomb porous bed solar generators with and without fluid transpiration including generator designs
p0062 N71-28586

HYBRID PROPELLANTS

Hybrid fossil nuclear fueled MHD power cycle characteristics
[BML-12569] p0082 N69-11230

HYDRATION

Hydration method for determination of sulfur in petroleum
[NSTIC/13106/67] p0079 N68-15630

HYDRAULIC EQUIPMENT

Liquid or solid propellant hot gas turbines as power source for hydraulic and electrical energy
p0181 A72-36558

HYDRAULIC FLUIDS

Viscous incompressible fluid hydraulics of magnetohydrodynamic generators
[AD-751465] p0252 N73-16718

HYDRAULIC SHOCK

MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters
p0149 A69-27499

HYDRAZINE ENGINES

Proportional-integral control of reactants supply for hydrazine-oxygen fuel cells with pulse controlled solenoids
p0177 A72-18290

Hydrazine-air fuel cell controls
[AD-684339] p0221 N69-28781

HYDRAZINES

Hydrazine-air fuel cells design features, auxiliary components and performance characteristics
p0119 A68-13240

Hydrazine-fuelled battery low power consumption auxiliary system with voltage regulator and gas pumps
p0170 A70-43539

Hydrazine-oxygen fuel cell design and operation, discussing efficiency, electrolyte space, etc
p0170 A70-43541

Hydrazine-oxygen fuel cells energy costs minimization by optimizing diaphragm thickness, hydrazine concentration and load
p0171 A71-14321

Optimizing power efficiency of hydrazine-oxygen fuel cells.
p0187 A73-29598

High power density hydrazine-oxygen fuel cell, discussing cell polarization, critical resistance losses and efficiency
p0188 A73-38398

SUBJECT INDEX

HYDROGEN FUELS

- Design, testing, and performance of 5-kilowatt hydrazine/potassium hydroxide air fuel cell modules
[MBB4026F] p0191 N68-11503
- Hydrazine air fuel cell power generating module capable of 120 watts continuous output
[AD-74477] p0249 N72-32078
- Characteristics of hydrazine-oxygen fuel cell operating under moderate temperature conditions and various power density concentrations
[AD-764530] p0255 N73-33009
- HYDROBALLISTICS**
Performance characteristics of electroballistic direct power generators
[AGARDOGRAPH 81] p0124 A68-22536
- HYDROCARBON COMBUSTION**
Nonequilibrium modes of MHD converters, discussing electrically and magnetically induced nonequilibrium ionization, inhomogeneous flow, radical and ion recombination in combustion systems
[AGARDOGRAPH 81] p0123 A68-22531
- Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products
p0172 A71-22136
- HYDROCARBON FUELS**
Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0072 A68-45023
- Packed bed catalytic reactors cooling capacity in promoting endothermic reactions of hydrocarbon fuels, using computerized temperature and composition profiles
[AIAA PAPER 69-588] p0072 A69-33265
- Computerized calculation of gas turbine cycles thermal efficiency, using hydrocarbon fuel, considering fuel composition and heat of combustion changes
p0073 A70-43439
- Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0073 A71-24852
- Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion
p0115 A71-44365
- High temperature zirconium dioxide electrolyte fuel cell systems design and operation with methane or gasoline as fuel, evaluating performance characteristics
p0182 A73-15118
- Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films.
[WSCI PAPER 72-27] p0075 A73-16687
- Constant pressure apparatus for measuring oxygen absorption of petroleum hydrocarbons at high temperatures
[TG-230-T533] p0079 N68-15844
- Survey on organic geochemistry origins and use of gas-liquid chromatography and mass spectrometry analyses of organic components isolated from crude oils and sediments
[NASA-CN-93111] p0079 N68-17316
- Mathematical simulation of solution-gas drive performance of volatile oil reservoir using digital computer
p0080 N68-21049
- Available energy sources and sources of future including nuclear fusion and fission
[LA-DC-9519] p0010 N68-28181
- Natural isotopic distribution studies for evaluation of new hydrocarbon deposits
[SH-112/27] p0085 N69-30801
- Catalytic and thermal reforming of gaseous hydrocarbons with steam into town gas
[NASA-TT-F-13668] p0095 N71-28159
- Factors relevant to development of fuels and energy policies compatible with environmental control
p0016 N71-29471
- Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines
[PB-200144] p0097 N72-10830
- Fossil fuel and nuclear fission resources for energy
[A/CONF-49/P/359] p0098 N72-16981
- Hydrocarbon fuels and fuel systems that meet cooling and propulsion requirements of advanced air breathing engines
[AD-737372] p0100 N72-23806
- Production of fluid fuels and chemicals from coal
[BM-IC-8551] p0101 N72-30123
- Conservation of fossil fuels in commercial aviation by using hydrogen
[NASA-CR-112204] p0102 N73-11019
- HYDROCARBONS**
Viscosity-temperature chart for hydrocarbons permitting linear extrapolations into low viscosity high temperature regions
p0072 A69-23975
- 17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734
- Generation of hydrocarbons from straight chain fatty acid, formation of long chain n-alkanes, and origin of crude oil
p0078 N68-10414
- Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air
p0080 N68-19175
- Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology
[SH-112/24] p0084 N69-30799
- Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets
[SH-112/25] p0085 N69-30800
- Characteristics of protective effect of petroleum soluble corrosion inhibitors for iron in electrolyte hydrocarbon two-phase system
[AD-694781] p0258 N70-14391
- Ultra-reliable power processor for hydrocarbon-air fuel cell power systems
[AD-699311] p0231 N70-23985
- Design and development of 1.5 kilowatt fuel cell powerplant for field use
[AD-730796] p0246 N72-14040
- HYDRODYNAMIC EQUATIONS**
MHD generator two dimensional analysis for studying edge effect, taking into account Hall effect
p0149 A69-14099
- HYDROGEN**
High energy density silver-hydrogen cells for space and terrestrial applications.
p0188 A73-38403
- Cost estimates for manufacturing hydrogen and oxygen in water electrolysis and fossil fuel plants
p0117 N70-14511
- Design of hydrogen generating fuel cell
[AD-733931] p0118 N72-18520
- Hydrogen and other synthetic fuels
[TID-26136] p0118 N73-33738
- HYDROGEN FUELS**
Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion
p0115 A71-44365
- Air breathing hypersonic aircraft technology developments in propulsion systems and structures with emphasis on use of hydrogen fuel
[AIAA PAPER 73-58] p0009 A73-17631
- Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft.
p0009 A73-22830
- The use of hydrogen for aircraft propulsion in view of the fuel crisis.
p0009 A73-35469
- Nitrogen oxide turbojet emissions minimization with hydrogen compared to kerosene /JP/ fuels due to flammability limits, burning velocity and introduction in combustor as gas
p0116 A73-37498
- Electrolytic hydrogen fuel production with solid polymer electrolyte technology.
p0116 A73-38413
- Potential of hydrogen fuel for future air transportation systems.
[ASME PAPER 73-ICT-104] p0010 A73-43499

- Study, cost, and systems analysis of present and projected liquid hydrogen production
[NASA-CR-73226] p0011 N69-28227
- Design and development of air breathing engine system for space shuttle vehicle
p0017 N71-29607
- Nuclear energy in hydrogen production by water dissociation method
[EUR-4838] p0020 N73-15699
- Development and characteristics of hydrogen-based mobile fuel systems and analysis of technical and economic problems in large scale application
[UCRL-51228] p0020 N73-16766
- Preliminary appraisal of hydrogen and methane fuel and fuel tank configuration in Mach 2.7 supersonic transport
[NASA-TN-X-68222] p0020 N73-22711
- HYDROGEN ISOTOPES**
- Power production based on controlled fusion of deuterium and tritium nuclei, noting use of magnetic bottle for plasma confinement
p0131 A68-32685
- HYDROGEN OXYGEN ENGINES**
- H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report.
[IEEC PAPER 739028] p0116 A73-38436
- Construction and evaluation for spacecraft use of hydrogen-oxygen fired thermionic generators and diodes
[NASA-CR-101745] p0222 N69-30871
- HYDROGEN OXYGEN FUEL CELLS**
- Fuel cells history, development and operation emphasizing materials, applications and engineering problems for cells using hydrogen and oxygen /pure or as air/
p0128 A68-24323
- Performance studies on a rechargeable hydrogen-oxygen fuel cell.
p0186 A73-25988
- Hydrazine and methanol fuel cells comparison with hydrogen-air cells in terms of fuel costs and conversion efficiency, considering electric generators and automotive applications
p0116 A73-45025
- Hydrogen-oxygen fuel cell technology for space shuttle electrical power requirements
p0237 N70-40974
- Hydrogen oxygen fuel cells for electric power plants and Apollo spacecraft
[DLR-MIT-79-C9] p0239 N71-15723
- Fuel cell technology program to advance state-of-the-art of hydrogen oxygen fuel cells using P and WA PC8R technology
[NASA-CR-128519] p0249 N72-30029
- HYDROGEN PLASMA**
- Energy requirements for proton production by electron impact of hydrogen plasma
[NASA-TN-X-52344] p0116 N68-24657
- HYDROGENATION**
- Microorganism growth with petroleum fuels
[AD-680804] p0083 N69-20205
- HYDROGEOLOGY**
- Geological analysis of aerial thermography of the Canary Islands, Spain.
p0077 A73-39896
- HYDROLOGY**
- Remote airborne laser fluorosensor for sensing environmental pollution and hydrology
[UTIAS-175] p0099 N72-20479
- Physical interpretation of geology, hydrology, and glaciology revealed by ERTS-1 imagery of east central Ohio
[E73-10454] p0106 N73-20413
- HYDROSTATICS**
- Hydrostatic power transmission systems
Classifications, considering transformation, transport and accumulation of energies /mass, heat, optical, chemical, pneumatic, hydraulic, etc/
p0257 A71-36202
- HYPERSONIC AIRCRAFT**
- Hypersonic aircraft technology, discussing long range transport, reusable launch vehicles and propulsion systems
p0115 A70-31851
- Hypersonic airbreathers aerodynamic, structural and propulsive system interactions, discussing hydrogen fuel heat sink, airframe and engine cooling and airframe materials
[ICAS PAPER 70-16] p0115 A70-44127
- Air breathing hypersonic aircraft technology developments in propulsion systems and structures with emphasis on use of hydrogen fuel
[AIAA PAPER 73-58] p0009 A73-17631
- Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft.
p0009 A73-22830
- Hypersonic transports - Economics and environmental effects.
p0009 A73-34435
- Weight estimation and analysis of major structural components of hypersonic, liquid hydrogen fueled aircraft
[NASA-TN-D-6692] p0118 N72-18911
- HYPERSONIC VEHICLES**
- Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0072 A68-45023
- Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks
[AIAA PAPER 68-997] p0073 A71-24852
- ICE**
- Oil spread over Arctic ice, considering spread rate and oil slick size attainment for pollution potential during spills on tundra or pack ice
[AIAA PAPER 73-701] p0076 A73-36250
- Monitoring and evaluation of water quality, ice cover on Great Lakes, spread of crop viruses, and damage to strip mining areas
p0101 N72-29317
- ICELAND**
- ERTS-1 imagery of Namafjall geothermal area, Iceland
[E73-10874] p0111 N73-29225
- ILLINOIS**
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10096] p0105 N73-18321
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10371] p0105 N73-19366
- Skylab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337
- IMAGERY**
- Geological mapping of New York State based on ERTS-A imagery
[E72-10020] p0101 N72-29272
- Ecological effects of strip mining in Ohio based on interpretation of ERTS-1 imagery
[E72-10069] p0101 N72-31353
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry
[E72-10064] p0102 N72-32336
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana
[E72-10193] p0102 N73-10372
- Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio
[E72-10259] p0102 N73-12358
- Suitability of ERTS-1 imagery for oil exploration in Oklahoma
[E72-10327] p0103 N73-14315
- Geographic applications of ERTS-1 imagery to rural landscape change in Tennessee
[E72-10355] p0103 N73-14383
- Utilization of ERTS-1 imagery for mapping large scale structural lineaments in Precambrian Shield and basins containing younger sediments and for mineral and petroleum exploration
[E73-10004] p0104 N73-15340
- Resources management in Ohio utilizing ERTS-1 imagery
[E73-10032] p0104 N73-15365

SUBJECT INDEX

INDUSTRIES

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10096] p0105 N73-18321

ERTS-1 imagery of geosstructures of Alaskan continental crust and relation to mineral resources
[E73-10321] p0105 N73-18353

Oil exploration in Oklahoma using ERTS-1 MSS imagery
[E73-10322] p0105 N73-18354

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10371] p0105 N73-19366

Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376

Ecological effects of coal strip mining in Ohio
[E73-10430] p0106 N73-20391

Suitability of ERTS-1 imagery for oil exploration
[E73-10444] p0106 N73-20404

Physical interpretation of geology, hydrology, and glaciology revealed by ERTS-1 imagery of east central Ohio
[E73-10454] p0106 N73-20413

ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California
[E73-10478] p0107 N73-21315

Application of ERTS-1 MSS imagery to multidisciplinary investigations in Alabama
[E73-10509] p0107 N73-22284

IMAGING TECHNIQUES

EREP imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337

IMPACT TESTS

Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions
[AIAA PAPER 70-1221] p0008 A71-22779

IMPURITIES

Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency
p0041 A73-14213

INCIDENT RADIATION

Calculation of the solar radiation incident on an inclined ribbed surface
p0040 A72-43194

INCINERATORS

Ecological significance of utilization of waste heat generated by rubbish combustion, industrial furnaces, electrical fixtures and human beings
p0071 A68-21940

INCOMPRESSIBLE FLUIDS

Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc
p0165 A70-25525

Electrical parameters of synchronous MHD generator with pulsating electrical conductivity of incompressible fluid
[SM-74/210] p0211 N69-13333

INDEPENDENT VARIABLES

Design parameters for molten salt breeder reactor
[WASH-1097] p0090 N70-19219

Gas parameters in ideal magnetohydrodynamic generators with infinite electrode segmentation
[IPP-3/97] p0230 N70-21895

Orbit parameter and constraint effects on solar generator design
p0057 N70-22507

INDEXES

Indexes for inventory of energy research
p0018 N72-25931

INDIA

Feasibility of construction and use of solar thermoelectric generators in India
[M7] p0054 N69-24313

INDIANA

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana
[E72-10193] p0102 N73-10372

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10096] p0105 N73-18321

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10371] p0105 N73-19366

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana
[E73-10776] p0108 N73-27252

Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277

Application of ERTS-1 imagery to study of fracture-related safety hazards in Indiana coal mining industry
[E73-10970] p0111 N73-30311

Skylab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337

INDUCTION HEATING

Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings
[MATT-659] p0218 N69-23954

INDUCTORS

One megajoule inductive energy storage system using water cooled air core coil with optimum shape
p0261 A68-23903

Induction MHD generator without electrodes, where freely flowing plasma currents electromagnetically induce currents in output coil
p0130 A68-29309

Ponderomotive forces acting upon conductive bodies in traveling magnetic field of cylindrical inductor, and effect on magnetohydrodynamic generator design
p0195 N68-16292

INDUSTRIAL MANAGEMENT

Reliability analysis on petroleum industry requirements
p0100 N72-25986

INDUSTRIAL PLANTS

Pilot plant for solvent extraction of strontium 90 from fission products
[EUR-3613.F] p0078 N68-10864

Titration method for uranium concentration analysis in solutions of irradiated fuel reprocessing plants
[CNEA-192] p0079 N68-17192

Peaceful application of nuclear energy
[TID-24102] p0010 N68-18384

Computerized simulation of optimal automatic control of coal treatment plant
[AD-682791] p0084 N69-26099

Cost estimates for nuclear energy and heat use in various industrial plant processes
p0013 N70-14504

Cost estimates for manufacturing hydrogen and oxygen in water electrolysis and fossil fuel plants
p0117 N70-14511

Bibliography on applications of nuclear explosions in mines, chemistry, and gas and oil extraction
[CEA-BIB-129-ADD-1] p0104 N73-17719

INDUSTRIAL SAFETY

Operation of 20 Mw Hall MHD generator and associated equipment, noting safety precautions and devices
p0127 A68-23919

Application of ERTS-1 imagery to study of fracture-related safety hazards in Indiana coal mining industry
[E73-10970] p0111 N73-30311

INDUSTRIES

Algorithms for optimization of transportation and storage in petroleum industry
p0257 N68-14618

- Technological level and production of atomic industry in U.S.S.R. and other nations
[NIC-TRANS-2653] p0011 N68-38243
- Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology atomic energy industry
[TID-24190] p0012 N69-17184
- Magnetohydrodynamic power generator development for commercial application
p0221 N69-28597
- Natural resource and industrial programs for nuclear fuel research
[NASA-CR-107560] p0089 N70-15491
- Congressional hearings on air pollution control research in motor vehicle, aircraft, and diesel exhausts, and industrial and federal facilities wastes
p0015 N70-36154
- Magnetohydrodynamic generator development and applications in radiating power plants, propellant-cooled propulsion systems, and industry
p0243 N71-33661
- Development and distribution of natural resources to satisfy energy requirements of US industry during the 1970's
[BM-IC-8526] p0096 N71-36393
- Statistical data compilation of historical facts and figures and current status of US uranium industry as of 1 Jan 1971
[TID-25814] p0099 N72-20472
- Heliothermic conversion of solar radiation for industrial use
p0069 N73-33767
- INFLATABLE STRUCTURES**
Solar energy concentrator technology, design, and fabrication techniques
[NASA-TM-X-59043] p0049 N68-27643
- Calorimetric evaluation of three 1.5-meter diameter inflatable rigidized solar concentrators for solar dynamic cycle power systems
[NASA-TN-D-5234] p0054 N69-28123
- INFRARED DETECTORS**
Effectiveness of remote sensor techniques for detecting oil films on water surface
[AD-728422] p0098 N72-14478
- INFRARED INSTRUMENTS**
Temperature measurement of products in solar furnace by IR pyrometers, considering interference filters, reflections parasitic effects, etc
p0032 A70-32424
- INFRARED PHOTOGRAPHY**
Thermal activity of the Usón Caldera based on infrared and photographic aerial survey.
p0077 A73-39895
- INFRARED SCANNERS**
Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner
p0074 A72-16600
- Geological analysis of aerial thermography of the Canary Islands, Spain.
p0077 A73-39896
- Aerial infrared scanner to locate and detect subsurface coal fires
p0086 N69-33683
- Design of multispectral scanner for orbital earth resources detection
[NASA-CR-102111] p0089 N70-16407
- INHOMOGENEITY**
Plasma inhomogeneities effects on MHD generators I-V characteristics, energy conversion efficiency and optimum duct geometry
p0167 A70-39636
- INITIATION**
Minimum required energies for direct initiation of gaseous detonation waves in acetylene-oxygen mixtures
[BM-RI-7061] p0116 N68-12434
- INJECTORS**
Acceleration devices for liquid metal magnetohydrodynamic generators
[NASA-CR-97885] p0209 N69-13151
- Injector characteristics using wet steam in connection with magnetohydrodynamic generator applications
[NASA-CR-97878] p0209 N69-13286
- INLET FLOW**
MHD generators physical phenomena, discussing thermal efficiency, inlet parameters, operating principles, etc
p0163 A70-14716
- Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products
p0172 A71-22136
- INORGANIC MATERIALS**
Thermal cells stressing lithium anode cells with various cathodes in eutectic electrolyte, discussing inorganic separators compatibility
p0261 A68-42515
- INSTRUMENT ERRORS**
Absorber positioning inaccuracy influence in concentrating solar unit mirror on unit energy parameters, discussing defocusing
p0030 A70-10763
- INSTRUMENT ORIENTATION**
Thermal response of bimetal thermostat solar array orientation device
p0063 N72-13396
- Development of solar energy powered heliotrope assembly to orient solar array toward sun
[NASA-CASE-GSC-10945-1] p0065 N72-31637
- INSULATED STRUCTURES**
Structural analyses on space vehicle insulation, solar panels, and temperature sensor responses
p0057 N70-22865
- INTAKE SYSTEMS**
Electron temperature instabilities in entrance region of magnetohydrodynamic generator
[NASA-TM-X-1761] p0217 N69-20875
- INTERFACIAL TENSION**
Oil slick spreading on calm sea due to force of gravity and surface tension of water
p0257 N70-10537
- INTERNAL COMBUSTION ENGINES**
Automobiles and air pollution, with internal combustion engine controls and alternative power plants
p0016 N70-39315
- Development and characteristics of hydrogen-based mobile fuel systems and analysis of technical and economic problems in large scale application
[UCRL-51228] p0020 N73-16766
- Analysis of factors influencing technical feasibility of operating aircraft on liquid hydrogen fuel
[NASA-TN-X-68242] p0021 N73-24777
- INTERNAL ENERGY**
Book on energy conversion statics covering state functions, quasi-static processes, internal energy, chemical energy storage and conversion, dynamics and postulates and laws
p0166 A70-27670
- INTERNATIONAL COOPERATION**
Feasibility analysis for utilization of solar energy in developing countries
[PB-208550] p0064 N72-31092
- INTERNATIONAL LAW**
Outer continental shelf lands of United States - Vol. 1, international considerations and federal jurisdiction
[PB-198714] p0014 N70-25747
- Outer continental shelf lands of United States - Vol. 4, appendices on legal matters
[PB-188717] p0015 N70-25750
- Outer continental shelf lands of United States - Vol. 6, appendices including offshore mineral leasing acts, foreign laws and policies, and compilation of alternatives
[PB-188719] p0015 N70-25752
- INTERPLANETARY SPACECRAFT**
Solar cells, radioisotope generators, fission electric cells, and thermionic converters considered for Jupiter spacecraft mission
p0201 N68-21480
- INVERTED CONVERTERS (DC TO AC)**
Construction and tests of MHD generator channel and electrical power converter
[AD-758783] p0253 N73-25106
- INVESTMENT**
Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392

ION CURRENTS

Ion generation by corona discharge in electrofluid dynamic energy conversion p0198 N68-17817

Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators [AGARDOGRAPH-122] p0215 N69-18439

ION CYCLOTRON RADIATION

Plasma dynamics experiments related to controlled nuclear fusion p0209 N69-13069

ION DENSITY (CONCENTRATION)

Measurements of plasma parameters in simulated thermionic converter with cesium plasma for spacecraft use p0245 N72-10852

ION ENGINES

Thermionic power generation, discussing neutralization and unignited and ignited modes of thermionic converters p0119 A68-12962

Nuclear energy systems, discussing U.S. reactor concepts with emphasis on thermionic systems and space applications p0156 A69-29278

Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma p0176 A71-38949

Design studies and efficiency evaluations for five spacecraft thermionic reactor systems [REPT.-68-007] p0201 N68-21856

Hollow cathode operation and plasma discharge in mercury ion engine, potential distribution of glow discharge, and liquid metal MHD power conversion p0214 N69-16485

Electron bombardment ion engine having 0.015 N thrust, 30 km/sec exhaust velocity, and 550 W deployable solar array proposed for Black Arrow X5 spacecraft [RAE-TR-68191] p0054 N69-24137

ION EXCHANGE MEMBRANE ELECTROLYTES

Fuel cells with solid membranes with ion conductivity, discussing proton electrolyte p0156 A69-32424

ION MOTION

Ion adsorption mechanism and electrochemical energy conversion on fuel cell electrode [NASA-CR-100892] p0219 N69-25396

ION PRODUCTION RATES

Unipolar ions or charged colloids generation in high speed gaseous working media for electrofluid dynamic energy conversion, discussing corona discharge configurations [AGARDOGRAPH 81] p0124 A68-22537

ION RECOMBINATION

Techniques for improving performance of gallium arsenide solar cells by ion implantation [NASA-CR-135510] p0068 N73-30977

IONIZATION

Microwave ionization for obtaining nonequilibrium plasma in MHD generators [NASA-TT-P-13783] p0242 N71-32212

IONIZATION POTENTIALS

Secondary ionization and its possible bearing on the performance of a solar cell. p0040 A73-12048

IONIZED GASES

Closed cycle plasma MHD systems, discussing nonequilibrium ionization, reactor economics, performance and requirements p0126 A68-22960

Electrical conductivity tensor effect on ionized gas flow in MHD generator with finite electrodes, discussing Hall current effect p0130 A68-29598

Plasma MHD power generator, considering seeded gases electrical properties and nonequilibrium ionization in induced electric field, noting rocket driven MHD generators p0132 A68-37062

Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity p0185 A73-23473

IONOSPHERIC CURRENTS

Ionospheric MHD generator based on utilizing solar energy [JPRS-46941] p0214 N69-13670

IRRADIATION

Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements [EUR-4243.F] p0085 N69-31119

Cost analysis for reprocessing of irradiated plutonium and uranium mixed oxides [CEA-CONF-1534] p0093 N70-39139

IRREVERSIBLE PROCESSES

Thermodynamic theory of irreversible processes in thermoelectric conversion, discussing Thomson and Peltier effects and ideal generator [AGARDOGRAPH 81] p0125 A68-22539

Thermal efficiencies of liquid-metal MHD generator cycles, analyzing optimum parameters, working fluid and partial irreversibilities p0148 A69-27484

Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0171 A71-16785

Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0174 A71-33037

Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations p0183 A73-20396

ISOPROPYL COMPOUNDS

Test evaluation of monoisopropyl diphenyl, and gas oil as organic reactor moderators [FTD-HT-66-746] p0079 N68-12884

ISOTENSOID STRUCTURES

Application of isotensoid flywheels to spacecraft energy and angular momentum storage [NASA-CR-1971] p0266 N72-17020

ISOTOPEs

Isotope Brayton space power systems and their technology. p0183 A73-20467

Development of isotopic power fuels for use at temperatures up to 2000 C [ORNL-4750] p0100 N72-24703

ISOTOPIC LABELING

Natural isotopic distribution studies for evaluation of new hydrocarbon deposits [SM-112/271] p0085 N69-30801

J-57 ENGINE

Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine [NASA-TN-D-6404] p0096 N71-31456

JAPAN

Status of MHD power generators and related technology in Japan [AD-727094] p0244 N71-38510

JET AIRCRAFT

Aircraft fuel system fire safety and prevention, and jet aircraft air pollution p0094 N70-40779

Combustion efficiency of annular turbojet combustor using heated natural gas as fuel [NASA-TN-X-2742] p0105 N73-18960

JET AIRCRAFT NOISE

Noise reduction modifications in JT3D and JT8D gas turbine engine by single stage fan replacements [SAE PAPER 730346] p0187 A73-34694

JET ENGINE FUELS

Methane potentials as fuel for advanced aircraft, discussing performance, economy, combustion, heat transfer and handling p0071 A68-33439

Liquid methane fuel substitution for kerosene in supersonic transport, discussing engine performance, aircraft design and cost reduction p0072 A68-44446

Soviet book on automotive and jet aircraft engine fuel chemical stabilizers under storage, transit and operational conditions, examining additives in relation to stability ratings p0073 A71-17433

- Comparison of ASTM-A1 liquid fuel and natural gas fuels in annular turbojet combustor at Mach 3
[NASA-TM-X-52766] p0087 N70-12102
- Fuel considerations for commercial supersonic transport aircraft
[AD-596588] p0117 N70-18542
- Conversion of experimental turbojet combustor from ASTM A-1 fuel to natural gas fuel
[NASA-TM-X-2241] p0094 N71-20533
- Analytical measurements of exhaust emissions from aircraft turbine engines using Jet A fuel
[BK-XI-7634] p0190 N72-25584
- Preliminary appraisal of hydrogen and methane fuel and fuel tank configuration in Mach 2.7 supersonic transport
[NASA-TM-X-68222] p0020 N73-22711
- Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity
p0022 N73-33928
- JET ENGINES**
Design and performance of turbofan engines
[AD-683118] p0226 N69-26520
- JET FLOW**
Sodium liquid-metal jet MHD generators tested under constant and rising magnetic fields and off and on-loads
p0151 A69-27511
- JET MIXING FLOW**
Jet compression role in high temperature mechanical energy conversion heat exchanger based on ejector principle
p0179 A72-27724
- JET PROPULSION**
Hypersonic aircraft technology, discussing long range transport, reusable launch vehicles and propulsion systems
p0115 A70-31851
- Jet propulsion optimization by energy and energy for minimum total cost flux by varying unit compressor pressure ratio
p0008 A71-21309
- JOSEPHSON JUNCTIONS**
Applications of superconductivity.
p0187 A73-34111
- JP-4 JET FUEL**
Aircraft and industrial gas turbine fuel requirements and properties noting costs
p0071 A68-35741
- JP-5 JET FUEL**
Aircraft and industrial gas turbine fuel requirements and properties noting costs
p0071 A68-35741
- JP-6 JET FUEL**
Aircraft and industrial gas turbine fuel requirements and properties noting costs
p0071 A68-35741
- JUNCTION DIODES**
Solar conversion efficiencies of p-n and n-p diodes calculated for specified semiconductor heterojunctions using Anderson diffusion model
p0026 A69-30034
- Solar cells with Si Schottky function diode, discussing fabrication and barrier metal and thickness effects on output power and energy conversion efficiency
p0042 A73-16816
- Silicon carbide unijunction diodes feasibility as solar cells and fabrication techniques
[NASA-CR-73444] p0059 N70-37465
- JUPITER (PLANET)**
Solar cells, radioisotope generators, fission electric cells, and thermionic converters considered for Jupiter spacecraft mission
p0201 N68-21480

K

KENTUCKY

- ERTS-1 imagery of landscape changes in Tennessee and Kentucky due to strip mining
[E72-10265] p0103 N73-12364
- Skyline monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337

KEROSENE

- Liquid methane fuel substitution for kerosene in supersonic transport, discussing engine performance, aircraft design and cost reduction
p0072 A68-44446
- Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products
p0172 A71-22136
- Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination
p0574 A71-28754
- Microorganism growth with petroleum fuels
[AD-680894] p0383 N69-20205
- KINETIC ENERGY**
Variable fluid and field velocity HF induction generator, determining interaction between fluid dynamic forces and magnetic field and kinetic energy
p0150 A69-27502
- Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity
p0185 A73-23473
- KLYSTRONS**
High power linear beam tube devices for space power generation station, considering use of klystron with heat pipes for low weight and high efficiency
p0035 A71-28669
- KRYPTON**
Performance tests of 2-15 kilowatt Brayton power system using krypton
[NASA-TM-X-52750] p0229 N70-19190
- KRYPTON 85**
Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants
[JPRS-53174] p0016 N71-26623

L

LABORATORY EQUIPMENT

- Laboratory device for investigating thermionic energy converters and measuring current-voltage characteristics by static/dynamic methods
p0156 A69-34700
- Facility for uranium enrichment by thermal diffusion
[XP-18173] p0093 N70-37298
- LAMINAR FLOW**
Piston-like laminar liquid metal flow in MHD generator to increase thermodynamic efficiency of cycle and to generate electricity by synchronous principle
p0148 A69-27491
- Laminar flow of liquid metals in channel of magnetohydrodynamic generators
[AD-680712] p0220 N69-26620
- LAND**
Remote sensing for coal mined land reclamation
[NASA-CR-124608] p0097 N72-12329
- LAND USE**
Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio
[E72-10259] p0102 N73-12358
- LANDSCAPES**
ERTS-1 imagery of landscape changes in Tennessee and Kentucky due to strip mining
[E72-10265] p0103 N73-12364
- Geographic applications of ERTS-1 imagery to rural landscape change in Tennessee
[E72-10355] p0103 N73-14343
- Geographic analysis and mapping of landscape changes in Tennessee from ERTS-1 imagery
[E73-10661] p0108 N73-25357
- ERTS-1 imagery of landscape changes, strip mines, timber, agriculture, and water resources in eastern Tennessee
[E73-10843] p0110 N73-28421

LASER HEATING

- Pulsed laser produced high temperature plasma for electric power generation by controlled nuclear fusion, discussing gas dynamic model
p0181 A72-43723
- Review of controlled fusion research using laser heating.
[AIAA PAPER 73-258] p0183 A73-17667

LASER OUTPUTS

Optical motor system to efficiently convert laser energy into mechanical rotational energy, giving equations for controlling motor speed

p0142 A69-22457

High power giant pulse YAG laser using nonlinear material to achieve complete second harmonic conversion in intracavity experiment

p0163 A70-16470

Plasma generation and heating by controlled thermonuclear fusion reactions using pulsed lasers

p0164 A70-22249

Laser energy conversion into electrical energy with photovoltaic cells, noting Si and GaAs cells power efficiencies improvement compared to operation in sunlight

p0040 A73-14210

Laser energy transfer - An analytic survey of high power applications.

p0257 A73-22822

Plasma production and heating by laser radiation with plasma control and production of thermonuclear plasma discussed

p0204 N68-30330

LASERS

Thermal or chemical energy conversion to electromagnetic radiation by laser, discussing atomic or molecular processes and thermodynamic limitations

p0176 A71-38939

Laser beam power transmission to lunar bases or spacecraft from nuclear fueled satellite power station, discussing achievable ranges and efficiencies

p0257 A72-35328

Pulsed thermonuclear reactor operated with lasers

p0237 N70-38825

Feasibility of using photovoltaic cells to convert laser energy into electrical energy

p0065 N73-12061

LAUNCH VEHICLES

Hypersonic aircraft technology, discussing long range transport, reusable launch vehicles and propulsion systems

p0115 A70-31851

LAW (JURISPRUDENCE)

Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases

p0017 N71-32624

Legal, economic, and technical aspects of liability and financial responsibility of oil pollution

p0017 N71-32625

LEAD (METAL)

Gas tight lead storage battery with negative plates for oxygen absorption

p0262 A70-46352

LEAD COMPOUNDS

Comparative emissions from leaded and prototype lead free automobile fuels

p0092 N70-28685

LEAD TELLURIDES

Parametric analysis of radioisotope cascaded thermoelectric generators with Si-Ge first stage and PbTe second stage

p0192 N68-14585

LEAKAGE

Transverse current leakage effect on energy conversion and Hall characteristics of MHD generator

p0171 A71-12195

Leak testing of containers and capsules for radioactive materials

p0091 N70-20349

LEGAL LIABILITY

Outer continental shelf lands of United States - Vol. 1, international considerations and federal jurisdiction

p0014 N70-25747

Outer continental shelf lands of United States - Vol. 2, legal and resource aspects

p0014 N70-25748

Outer continental shelf lands of United States - Vol. 4, appendices on legal matters

p0015 N70-25750

Outer continental shelf lands of United States - Vol. 5, appendices including bibliography, questionnaire to industry, oil and gas lease notices, and comparative laws and policies

p0015 N70-25751

Outer continental shelf lands of United States - Vol. 6, appendices including offshore mineral leasing acts, foreign laws and policies, and compilation of alternatives

p0015 N70-25752

Legal, economic, and technical aspects of liability and financial responsibility of oil pollution

p0017 N71-32625

Proceedings of conference on licensing and control of nuclear power plants

p0017 N71-35176

LENSES

Lens assembly for solar furnace or solar simulator

p0060 N71-15622

LIFE (DURABILITY)

Thermoelectric-couple life tests and efficiency measurements at constant thermal input, noting insulation for limiting parasitic heat losses

p0163 A70-14896

Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency

p0041 A73-14213

Performance and life test on thermionic converters and generators

p0201 N68-21597

Power sources for long economic life communication equipment

p0227 N70-13293

LIFE SUPPORT SYSTEMS

Radioisotopes to provide thermal energy for vacuum distillation and vacuum distillation-vapor pyrolysis in life support systems

p0080 N68-21041

LIGHT AIRCRAFT

Light aircraft standard fuel flight evaluation, discussing compatibility with grades 80/87 and 100/130 certified engines and comparative operational fuel consumption

p0073 A71-24239

Comparison of Wankel engine characteristics with small reciprocating and jet engines used as power plants in light aircraft

p0247 N72-20764

LIGHT SOURCES

Solar panel test set for testing solar cells with artificial light source

p0059 N70-38210

LIMESTONE

Developmental program for SO₂, NO, and particulate pollutant level lowering and control in flue gas from fossil fuel combustion using fluidized beds with limestone

p0096 N71-36736

LIVE CURRENT

Oxygen electrodes for fuel cells, and mechanism in transport of oxygen near line separating gas electrolyte electrode

p0200 N68-18025

LINEAR SYSTEMS

Longitudinal edge effect in linear induction magnetohydrodynamic generators

p0194 N68-16291

Comparative performance analysis of linear MPD generators

p0234 N70-32771

LININGS

Technical reference manual for protective interior liners of petroleum fuel containers

p0263 N68-23614

LIQUEFIED GASES

Liquid methane fuel substitution for kerosene in supersonic transport, discussing engine performance, aircraft design and cost reduction

p0072 A68-44446

LPG use in fuel cells, discussing efficiency, weight and size

p0073 A70-36657

Measurements of thermophysical properties of compressed fluid methane and survey of current literature on liquefied natural gas and methane

p0095 N71-22717

LIQUID COOLED REACTORS

SUBJECT INDEX

- Air pollutants in exhaust gas produced from LP-gas used in automotive engines
[BM-RI-7672] p0101 N72-31768
- LIQUID COOLED REACTORS**
Rankine cycle technology concerning high temperature, refractory alloy and liquid metal experience, showing applicability to nuclear Brayton and thermionic power systems
p0163 A70-12513
- LIQUID FLOW**
Liquid flow MHD alternating current generator design, considering induced current in rotor and resulting magnetic field in pole gap
p0149 A69-27495
Design and performance of one wavelength magnetohydrodynamic liquid flow induction generator
[NASA-CR-127891] p0249 N72-30655
- LIQUID HYDROGEN**
Cost analysis of liquid hydrogen for aircraft fuel, considering production methods, plant capacity and technological advances
p0001 A68-33457
Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion
p0115 A71-44365
Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft.
p0009 A73-22830
The use of hydrogen for aircraft propulsion in view of the fuel crisis.
p0009 A73-35469
Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809] p0009 A73-38373
Potential of hydrogen fuel for future air transportation systems.
[ASME PAPER 73-1CT-104] p0010 A73-43499
Study, cost, and systems analysis of present and projected liquid hydrogen production
[NASA-CR-73226] p0011 N68-28227
Analysis of factors influencing technical feasibility of operating aircraft on liquid hydrogen fuel
[NASA-TN-X-68242] p0021 N73-24777
- LIQUID INJECTION**
Heat losses in oil wells hot liquid injections, modifying Groveanu approximation method for exact solution
p0074 A72-15743
- LIQUID METAL COOLED REACTORS**
Failure data handbook for liquid metal cooled nuclear power plants
[LMSC-MEMO-69-7-VOL-1] p0234 N70-31239
- LIQUID METALS**
Performance characteristics of single wavelength liquid metal MHD induction generator with end loss compensation, determining electrical losses and power production
p0122 A68-19849
Coupling with liquid metal flywheel rotating under action of crossed electric and magnetic fields
p0123 A68-20399
Induction type liquid metal MHD generators with flat or cylindrical channels at large magnetic Reynolds number, discussing magnetic field equations
p0123 A68-20403
Liquid metal MHD power generation, discussing high magnetic Reynolds number direct AC induction generator, power cycles and operations
p0138 A68-42582
Two phase MHD generator with gas in liquid metal emulsions, discussing loops efficiency
p0147 A69-27479
Energy conversion with liquid metal working fluids in MHD generators, discussing single stage fully Carnotized process
p0147 A69-27482
Thermal efficiencies of liquid-metal MHD generator cycles, analyzing optimum parameters, working fluid and partial irreversibilities
p0148 A69-27484
- Liquid metal two phase flow MHD generators efficiency prediction, discussing end losses and flow velocity
p0148 A69-27485
Optimal cycle parameters for liquid metal single component MHD cycle, employing condensing ejector in front of generator
p0148 A69-27488
Liquid metal MHD generator cycles thermodynamic analysis, considering multicycle operation improvement with heat regeneration
p0148 A69-27489
Piston-like laminar liquid metal flow in MHD generator to increase thermodynamic efficiency of cycle and to generate electricity by synchronous principle
p0148 A69-27491
Liquid-metal MHD space power generation system using intermittent vaporization slugs shooting at 2700 R peak temperature
p0149 A69-27492
Liquid metal MHD induction generators design and performance, considering effect of geometry, operating conditions, fluid properties and power level on efficiency
p0150 A69-27503
Single wavelength design with compensation compared to multiwavelength design without compensation for liquid metal MHD induction converter, discussing optimization
p0150 A69-27504
Transient response in liquid-metal conduction MHD generators, analyzing constant magnetic field using differential equation
p0150 A69-27506
Rayleigh-Taylor instability in synchronous liquid metal MHD generators, showing stabilization by channel positioning and threshold power rating
p0150 A69-27508
Liquid metal induction MHD generator I-V characteristics at no load permitting self excitation with capacitors
p0151 A69-27509
Induction, helical and straight through liquid metal MHD generators tested under independent and self excitation conditions
p0151 A69-27512
Three phase high temperature liquid metal induction MHD generator performance, noting velocity profile nonuniformity influence
p0151 A69-27513
Liquid metal MHD conservation cycles, discussing evolution and status of power generation at various temperatures
p0167 A70-39325
Liquid metal MHD power conversion system with Cs and Li as working fluids, describing hydraulic, electrical and high temperature tests results
p0167 A70-39986
Liquid metal regenerator design and test evaluation for gas turbine engine fuel consumption improvement
[ASME PAPER 72-GT-33] p0178 A72-25629
Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications.
[ASME PAPER 72-AERO-12] p0181 A72-43148
NaK-nitrogen liquid metal MHD converter tests at 30 kW.
p0188 A73-38311
Ultrasonic instrumentation for incipient boiling detection in liquid metals or fused salts
[NYO-3622-10] p0190 N68-10758
Liquid metal stream acceleration by same metal vapor for application in magnetohydrodynamic generator
[ANL-TRANS-508] p0192 N68-12691
Direct current and electrodeless induction type magnetohydrodynamic power generators using liquid metals as working media optimized by means of variational calculus
[DLR-FB-67-71] p0193 N68-14746
Electromagnetic processes in magnetohydrodynamic induction machines with working media of liquid metal
[NASA-TT-F-460] p0194 N68-16286

- Magnetohydrodynamic induction generators with liquid metal working media, and electromagnet field structures
p0194 N68-16287
- Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities [JPRS-46752]
p0208 N69-11943
- Thermodynamic properties of liquid metal cycle in magnetohydrodynamic power generator with heat regeneration
p0208 N69-11944
- Acceleration devices for liquid metal magnetohydrodynamic generators [NASA-CR-97885]
p0209 N69-13151
- Electrical conductivity of two phase liquid metal flow in magnetohydrodynamic generator [NASA-CR-97872]
p0209 N69-13240
- Thermodynamics of two component liquid metal MHD power plant with vapor-liquid injector [SM-74/215]
p0212 N69-13335
- Applicability of electrodynamic approximation in theory of liquid metal MHD energy converters [SM-74/240]
p0213 N69-13348
- Numerical analysis of multistage liquid metal magnetohydrodynamic power conversion cycle [NASA-CR-100500]
p0217 N69-21376
- Laminar flow of liquid metals in channel of magnetohydrodynamic generators [AD-680712]
p0220 N69-26620
- Piston-type flow for regulating distribution instability in liquid metal synchronous magnetohydrodynamic generator [AD-685487]
p0221 N69-29892
- Magnetohydrodynamic generation of electricity by means of liquid metals using two phase flow [TM-69-E-06]
p0222 N69-31249
- Liquid metal magnetohydrodynamic energy conversion cycles for spacecraft supply [NASA-TM-X-63671]
p0224 N69-37703
- Magnetohydrodynamic generator for mixing nonconductive gas and liquid metal mist to form slugs [NASA-CASE-XLB-02083]
p0225 N69-39983
- Thermoelectric power conversion by liquid metal flowing through magnetic field [NASA-CASE-XNP-00644]
p0236 N70-36803
- MHD methods of obtaining electrical energy [AD-706160]
p0236 N70-37638
- Performance tests of liquid metal magnetohydrodynamic power converter
p0241 N71-22560
- Proceedings of conference on magnetohydrodynamic electrical power generation [AD-730450]
p0247 N72-15235
- LIQUID POTASSIUM**
- Rankine cycle turboelectric nuclear space power conversion system with liquid K as working fluid, discussing current technology status [GESF-623]
p0174 A71-33525
- Comparison of load-bearing conical nonload-bearing panel heat radiators for potassium Rankine nuclear power plant [NASA-CR-72307]
p0190 N68-10050
- Liquid metal magnetohydrodynamic generator hydraulic losses and duct flow [NASA-CR-97879]
p0209 N69-13288
- Construction and performance tests of induction type liquid potassium magnetohydrodynamic generator [NASA-CR-97876]
p0214 N69-13818
- LIQUID SODIUM**
- Thermally regenerative energy conversion system using galvanic cells with electrochemically combined sodium and mercury streams to produce alloy and energy
p0129 A68-27639
- Sodium liquid-metal jet MHD generators tested under constant and rising magnetic fields and off and on loads
p0151 A69-27511
- Liquid metal magnetohydrodynamic generator hydraulic losses and duct flow [NASA-CR-97879]
p0209 N69-13288
- Generation of electric power by liquid sodium-jet MHD generator [NASA-CR-97864]
p0214 N69-13391
- LIQUID-GAS MIXTURES**
- Two phase MHD generator with gas in liquid metal emulsions, discussing loops efficiency
p0147 A69-27479
- LIQUID-SOLID INTERFACES**
- High temperature solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using solar furnace
p0032 A70-30907
- Liquid metal MHD conservation cycles, discussing evolution and status of power generation at various temperatures
p0167 A70-39325
- LITERATURE**
- Literature survey on properties of microbiological synthesis of protein substances from petroleum hydrocarbons [JPRS-48150]
p0084 N69-29789
- LITHIUM**
- Secondary cells with liquid lithium anodes and immobilized fused salt electrolytes
p0262 A69-15330
- High energy long shelf life lithium-nickel sulfide batteries performance tests
p0262 A71-13041
- Fabrication criteria, mission design factors and I-V characteristics of Li solar cells
p0041 A73-14242
- Lithium-diffused p-n silicon solar cells of high conversion efficiency and improve resistance to space radiation effects [NASA-CR-97077]
p0051 N68-35814
- Electrical resistivity of liquid lithium saturated with cesium [NASA-CR-110370]
p0233 N70-29729
- Use of lithium/sulfur batteries as load-leveling devices in electrical utility networks [ANL-7958]
p0268 N73-30058
- LITHIUM FLUORIDES**
- Design and testing of lithium fluoride cavity receivers for solar power conversion systems [NASA-CR-54752]
p0237 N70-42202
- LITHOLOGY**
- Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology [SM-112/24]
p0084 N69-30799
- ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California [E73-10478]
p0107 N73-21315
- Oil exploration using ERTS-1 imagery of lithology and geological structures [E73-11053]
p0112 N73-32229
- LONG TERM EFFECTS**
- NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects [AIAA PAPER 71-825]
p0174 A71-34720
- Long term assessment of global and regional energy demands [X/CONF-49/P/420]
p0018 N72-16982
- LONG WAVE RADIATION**
- CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption
p0034 A71-11896
- LONGITUDINAL WAVES**
- Longitudinal edge effect in linear induction magnetohydrodynamic generators
p0194 N68-16291
- LOOPS**
- Operation, research, and maintenance of gas coolant loops of Peqase nuclear fuel testing reactor [CEA-R-3564]
p0221 N69-27494
- LORENTZ FORCE**
- Hall voltage reduction in linear MHD generators noting Lorentz force effect
p0133 A68-39722
- Hall type electromagnetic plasma accelerator, with thrust affected only by Lorentz forces in external magnetic field, compared to pure Hall accelerator
p0146 A69-25214
- LOW TEMPERATURE**
- Si solar cells low temperature and solar intensity performance optimization by identifying and eliminating low output problems
p0034 A71-16071

LOW TEMPERATURE ENVIRONMENTS

Radioisotope heater as heat source for maintaining silver-zinc battery temperatures in low ambient environment

p0261 A68-25659

Si solar cell technology, discussing contacts, low temperature performance and conversion efficiency

p0034 A71-16103

LOW TEMPERATURE PHYSICS

Paramagnetic cycles for low temperature superconducting magnet cooling, discussing refrigerator, cryogenic pumps, regenerators and adjustable heat source and sink

p0176 A71-40898

LOW TEMPERATURE TESTS

Solar cell characteristics at low temperatures, noting efficiency increase with decreasing temperature

p0027 A69-35691

Low temperature research for low cost improvement of acid fuel cell stacks

p0249 N72-33068

LOW THRUST PROPULSION

Electron bombardment ion engine having 3.015 N thrust, 30 km/sec exhaust velocity, and 550 W deployable solar array proposed for Black Arrow X5 spacecraft

p0054 N69-24137

LUBRICANTS

SST aircraft fuels and lubricants, discussing fire hazard and pollution minimization

p0073 A70-29999

Petroleum products handbook - oil additives, viscosity, antioxidants, anticorrosion, detergents, antifoams, and lubricants

p0092 N70-23049

LUBRICATING OILS

Aromatic hydrocarbon influence on lubricity of petroleum oils, noting mixtures with paraffins, low loads scuffing and decomposition

p0071 A68-41768

Petroleum products handbook - drive-train oils, lubricating oils for aircraft gas turbine engines, industrial and insulating oils

p0092 N70-23048

LUNAR BASES

Parametric performance and design criteria for assessing feasibility of large solar array and fuel cell systems as primary power source for lunar-based water electrolysis system

p0051 N68-36000

Performance characteristics of SNAP 8 and solar cell electrical generating systems for lunar bases

p0237 N70-39278

LUNAR EXPLORATION

Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system

p0062 N71-36441

LUNAR ORBITER

Design and performance data of power subsystem in flight spacecraft Lunar Orbiter 3

p0054 N69-29374

LUNAR TOPOGRAPHY

Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system

p0062 N71-36441

M

MACHINERY

Electrical DC collector machines and MHD magnetic systems design using superconductors, describing models

p0173 A71-32274

MAGNET COILS

Large-scale applications of superconducting coils.

p0183 A73-20107

MAGNETIC CIRCUITS

O shaped magnetic systems using unsaturated steel magnetic circuit to produce strong uniform magnetic fields for MHD machines

p0143 A69-23102

MAGNETIC COILS

MHD parameter optimization procedure for determining optimum coil geometry for 10 MW level superconducting magnet system

p0250 N73-11717

Cost analysis and design of possible fusion reactor coil systems

[UCRL-73187] p0019 N73-12741

MAGNETIC CONTROL

Engineering problems in the design of controlled thermonuclear reactors.

[AIAA PAPER 73-259] p0182 A73-16980

MAGNETIC EFFECTS

Magnetic Reynolds number effect in synchronous induction striated flow MHD generator

p0120 A68-15423

Plasma expansion in uniform guide field and plasma flow kinetic energy conversion to thermal energy by shock wave due to magnetic barrier

p0134 A68-41790

MAGNETIC FIELDS

Controlled nuclear fusion diagnostics, plasma stability and minimum magnetic field configuration

p0123 A68-20598

Traveling transverse magnetic field interaction with rigid conducting spheres or cylinders, discussing electromechanical characteristics and MHD energy conversion applications

p0129 A68-26140

Two terminal operation of diagonal connecting wall /DCW/ and Hall MHD generators under identical gasdynamic channel entrance conditions and magnetic field configurations

p0132 A68-39717

Nuclear fusion reactor development, discussing magnetic field confinement of hot dense plasmas and electric power production economic possibilities

p0142 A69-20124

Induced magnetic fields determination in linear DC MHD generators with ferromagnetic and nonmagnetic walls, using Fredholm equation

p0143 A69-2345a

Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance

p0144 A69-23463

Closed cycle MPD experiments with applied electric and magnetic fields emphasizing current leakage, segmentation, relaxation and aerodynamic effects

p0145 A69-23479

Hall type electromagnetic plasma accelerator, with thrust affected only by Lorentz forces in external magnetic field, compared to pure Hall accelerator

p0146 A69-25214

Faraday type MHD energy converters in nonequilibrium conduction mode, analyzing two dimensional current and potential distributions in plane normal to magnetic field

p0146 A69-25397

Constant and traveling magnetic fields MHD converters induction and finite dimensions influence analyzed by conformal mapping, separation, Fourier and finite difference methods

p0147 A69-25399

MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters

p0149 A69-27499

Variable fluid and field velocity HF induction generator, determining interaction between fluid dynamic forces and magnetic field and kinetic energy

p0150 A69-27502

Transient response in liquid-metal conduction MHD generators, analyzing constant magnetic field using differential equation

p0150 A69-27506

Sodium liquid-metal jet MHD generators tested under constant and rising magnetic fields and off and on loads

p0151 A69-27511

Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field

p0157 A69-39027

MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid

p0176 A71-40020

- Electric conductivity in argon potassium and helium potassium plasmas with elevated electron temperature in crossed electric and magnetic fields
[IPP-3/59] p0190 N68-10892
- Explosive devices for converting explosive energy into magnetic fields for direct power generators
[UCRL-TRANS-10133] p0192 N68-14541
- Higher spatial harmonics of magnetic field in induction magnetohydrodynamic generator
p0194 N68-16289
- Ponderomotive forces acting upon conductive bodies in traveling magnetic field of cylindrical inductor, and effect on magnetohydrodynamic generator design
p0195 N68-16292
- Comparison of magnetic systems for producing large scale magnetohydrodynamic generators
[AD-683989] p0219 N69-26189
- Design, development, and operation of compact, high performance, magnetohydrodynamic generators
[AD-756489] p0253 N73-23765
- MAGNETIC FLUX**
- One-wavelength MHD induction generator operated on NaK flow system with various excitation conditions, calculating magnetic flux density and power by Fourier series
p0179 A72-29364
- Hall current effects in the Lewis magnetohydrodynamic generator.
p0184 A73-22823
- Electrical conductivity of plasma in MHD generator
[SM-74/236] p0213 N69-13346
- MAGNETIC INDUCTION**
- Design and performance of explosive driven magnetic generators, giving line drawings and current oscillograms
p0120 A68-15139
- Magnetic Reynolds number effect in synchronous induction striated flow MHD generator
p0120 A68-15423
- Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity
p0120 A68-16523
- Induction type liquid metal MHD generators with flat or cylindrical channels at large magnetic Reynolds number, discussing magnetic field equations
p0123 A68-20403
- MHD generator induced magnetic field and end effects, considering electrically conducting fluid expansion in rectangular tube under external magnetic field
p0126 A68-22803
- Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model
p0130 A68-29186
- Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity
p0131 A68-30774
- Annular induction MHD generators, giving input and output densities, electrical conversion efficiency, etc
p0139 A68-43072
- Striated flow induction synchronous MHD generator, producing striated flow by nonthermal ionization of inert seeded gas in electric field
p0145 A69-23487
- One dimensional calculations of finite length MHD uniform traveling wave induction generator, discussing magnetic field distribution, electrical impedance and conversion efficiency
p0149 A69-27494
- Three phase high temperature liquid metal induction MHD generator performance, noting velocity profile nonuniformity influence
p0151 A69-27513
- Ideal MHD induction converter pressure and generator cycles compared for calculating maximum output and pressure, considering current-conducting walls effects
p0151 A69-28887
- One wavelength MHD induction generator, discussing field pressure gradients, fluid velocities, excitation and electrical output power
p0169 A70-40015
- Transverse edge effect in plane induction magnetohydrodynamic generators
p0194 N68-16290
- Optimization of constant current electromagnet in MHD generator
[SM-74/83] p0210 N69-13317
- Linear approximation of finite length magnetohydrodynamic induction converter
[UCRL-50537] p0221 N69-28635
- Optimum geometric relationships in coaxial linear induction magnetohydrodynamic generator
[AD-685523] p0221 N69-29843
- Design and tests of MHD induction generator operating on liquid flow
[NASA-CR-110154] p0233 N70-29169
- Magnetic induction concentric cylinder magnetohydrodynamic generator with cryogenic cooling
[DLB-FB-70-25] p0240 N71-17840
- Inductive magnetic energy storage with superconductors or cryogenic aluminum conductors
[LA-DC-12990] p0267 N72-17829
- MAGNETIC MATERIALS**
- Mechanical to electrical energy conversion of ferromagnetic, paramagnetic and diamagnetic materials by MHD converter and dielectric material by electrocaloric effect
p0128 A68-25934
- MAGNETIC MIRRORS**
- Current and proposed experiments on magnetic mirror confinement of fusion plasmas
[TID-24254] p0203 N68-29063
- MAGNETIC POLES**
- Design of magnetohydrodynamic induction machine with end poles which produce compensating magnetic fields
[NASA-CASE-1NF-07481] p0218 N69-21929
- MAGNETIC PROPERTIES**
- Mechanical energy storage by flywheel with magnetic fluid hermetic seal and bearing, using anisotropic and whisker materials
p0263 A73-25979
- Magnetic systems using steel for magnetohydrodynamic generators
[AD-688393] p0224 N69-35280
- Research and development of superconducting magnetic systems for MHD generators using Nb-Ti alloys
[AD-706779] p0237 N70-37715
- MAGNETIC PUMPING**
- Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion.
p0190 A73-41676
- MAGNETIC SUSPENSION**
- Modification of dc motor with magnetically suspended rotor to increase momentum storage capacity
[NASA-CR-115792] p0266 N71-13514
- MAGNETIZATION**
- Transient processes in superconducting magnets in MHD generators
[SM-74/229] p0212 N69-13341
- MAGNETOACOUSTIC WAVES**
- Hall magnetohydrodynamic generators instability to magnetoacoustic waves
[RR-323] p0217 N69-21275
- MAGNETOHYDRODYNAMIC FLOW**
- MHD channel flow approximation calculation for determining optimal MHD power generation conditions
p0122 A68-18450
- Plasma flow in MHD generator channel with series connected electrodes analyzed to select flow regimes
p0122 A68-19561
- MHD generator induced magnetic field and end effects, considering electrically conducting fluid expansion in rectangular tube under external magnetic field
p0126 A68-22803
- One dimensional plasma flow variables relations analyzed in crossed electric and magnetic fields with small magnetic Reynolds numbers
p0126 A68-23796

- Potential distribution measurement in duct with propane/oxygen combustion gas flow in argon plasma MHD generator
p0128 A68-24872
- Electrical conductivity tensor effect on ionized gas flow in MHD generator with finite electrodes, discussing Hall current effect
p0130 A68-29598
- Plasma expansion in uniform guide field and plasma flow kinetic energy conversion to thermal energy by shock wave due to magnetic barrier
p0134 A68-41790
- MHD energy converters electric fields and current distributions, analyzing MHD flow problems
p0157 A69-39480
- Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc
p0165 A70-25525
- MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid
p0176 A71-40020
- Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics
[AFOSR-68-0859]
p0202 N68-26537
- Distribution of current on electrodes in magnetohydrodynamic channel
[SU-IPM-230]
p0205 N68-31787
- Plasma flow in duct of series MHD generator
[SM-74/225]
p0212 N69-13339
- Magnetohydrodynamic flow, boundary layers, and plasma diagnostics in MHD ducts
[JPBS-48041]
p0219 N69-26241
- Magnetohydrodynamic flow in MHD ducts from point of view of boundary layer and shock wave theory
p0219 N69-26242
- Magnetohydrodynamic flow, surface properties, silicon solar cells, and thermoelectric properties of graphite compounds
p0223 N69-34812
- Engineering aspects of magnetohydrodynamics
p0241 N71-26458
- Design and performance of one wavelength magnetohydrodynamic liquid flow induction generator
[NASA-CR-127891]
p0249 N72-30655
- Test facility for combustion flow in open cycle magnetohydrodynamic generator
[AN-751251]
p0251 N73-16036
- MAGNETOHYDRODYNAMIC GENERATORS**
- Continuous electrode Faraday diagonal conducting wall and Hall MGD accelerators and generators performance characteristics
p0119 A68-12258
- Magnetic Reynolds number effect in synchronous induction striated flow MHD generator
p0120 A68-15423
- Effective conductivity in segmented electrode MHD generator with high electron temperature, using power law for electron collision frequency dependence
p0120 A68-15642
- Electrode and effects on plane flow of electrically conducting fluid in MHD generator, determining current and electrical potential functions
p0120 A68-16360
- Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity
p0120 A68-16523
- Problems and various processes of direct energy conversion covering thermoelectric, MHD generators, radionuclide batteries, thermionic converters and galvanic cells
p0121 A68-17792
- MHD power generation principles, considering increase of electric conductivity and stability
p0121 A68-17797
- Stability of MHD generator plasma under potential perturbation waves in ionized component of working body
p0121 A68-18285
- MHD channel flow approximation calculation for determining optimal MHD power generation conditions
p0122 A68-18450
- Plasma flow in MHD generator channel with series connected electrodes analyzed to select flow regimes
p0122 A68-19561
- Performance characteristics of single wavelength liquid metal MHD induction generator with end loss compensation, determining electrical losses and power production
p0122 A68-19849
- Buildup time for nonequilibrium argon ionization at inlet of MHD generator channel
p0122 A68-19914
- Large superconducting magnets for MHD power plants, discussing scale-up requirements, cryogenic system, stable operation margin and emergency system shutdown
p0122 A68-20175
- Coupling with liquid metal flywheel rotating under action of crossed electric and magnetic fields
p0123 A68-20399
- Induction type liquid metal MHD generators with flat or cylindrical channels at large magnetic Reynolds number, discussing magnetic field equations
p0123 A68-20403
- Diluent gas effect on alkali metal seeded rare gas nonequilibrium plasmas conductivity at various pressures, noting working fluid suitability in MHD generators
p0123 A68-20829
- Thermodynamics and design of open and closed cycle MHD energy conversion generators emphasizing end effects, Hall effects, heat transfer and aerodynamic losses
[AGARDOGRAPH 81]
p0123 A68-22530
- Nonequilibrium modes of MHD converters, discussing electrically and magnetically induced nonequilibrium ionization, inhomogeneous flow, radical and ion recombination in combustion systems
[AGARDOGRAPH 81]
p0123 A68-22531
- MHD generator induced magnetic field and end effects, considering electrically conducting fluid expansion in rectangular tube under external magnetic field
p0126 A68-22803
- Closed cycle plasma MHD systems, discussing nonequilibrium ionization, reactor economics, performance and requirements
p0126 A68-22960
- MHD generator mounted at shock tube downstream used to obtain magnetically induced ionization, considering minimum initial equilibrium electron density
p0126 A68-23120
- Electrode and boundary layer temperature effects on combustion driven MHD generator, discussing generator configuration
p0126 A68-23911
- Nonuniform current distribution effect on segmented electrode Hall MHD generators and accelerators
p0126 A68-23914
- Operation of 20 Mw Hall MHD generator and associated equipment, noting safety precautions and devices
p0127 A68-23919
- Two terminal operation of diagonal conducting wall and Hall generators under identical gas dynamic channel entrance conditions and magnetic field configurations
p0127 A68-23920
- Arc driven Hall MHD generator performance at strong MHD interaction parameters, noting channel stall as power limiting effects
p0127 A68-23921
- IV characteristics of water cooled MHD generator stressing metal electrode performance
p0127 A68-23925
- Closed cycle MHD experimental facility characteristics, discussing seeding, Faraday and Hall voltage measurements and plasma conductivity
p0127 A68-23929

- Striated flow production in induction synchronous MHD generator by nonthermal ionization of inert seeded gas in generator internal electric field
p0128 A68-23931
- One wave induction MHD converter performance advantages over uncompensated multiwave converter balanced by friction losses and inductive power requirements
p0128 A68-23932
- Potential distribution measurement in duct with propane/oxygen combustion gas flow in argon plasma MHD generator
p0128 A68-24872
- Two dimensional analysis of end region of single load crossconnected MHD generator, noting grading resistors use to remove infinite concentrations
p0128 A68-25596
- Mechanical to electrical energy conversion of ferromagnetic, paramagnetic and diamagnetic materials by MHD converter and dielectric material by electrocaloric effect
p0128 A68-25934
- Current density distribution in simulated argon-potassium MHD generator
p0129 A68-27085
- Electrode size effect on performance of MHD generator with nonuniform electrical conductivity, noting internal impedance sensitivity to electrode size
p0129 A68-27110
- Induction MHD machine current density distribution, electromagnetic induction, power density and Joule losses in working channel derived using approximate model
p0130 A68-29186
- Potential distribution in channel of liquid metal conduction MHD machine, examining electromagnetic channel pressure
p0130 A68-29187
- Induction MHD generator without electrodes, where freely flowing plasma currents electromagnetically induce currents in output coil
p0130 A68-29309
- Electrical conductivity tensor effect on ionized gas flow in MHD generator with finite electrodes, discussing Hall current effect
p0130 A68-29598
- Thermochemical MHD converter performance determined by slug model governed by differential equations
p0130 A68-29901
- Optimization of linear conduction MHD generator with constant cross sectional area channel
p0130 A68-30712
- Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity
p0131 A68-30774
- MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0131 A68-31226
- Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization
p0131 A68-31228
- Book on direct energy conversion covering fuel cells, thermionic and thermoelectric systems, radiation cells, fusion plasma and other MHD generators
p0132 A68-36891
- Plasma MHD power generator, considering seeded gases electrical properties and nonequilibrium ionization in induced electric field, noting rocket driven MHD generators
p0132 A68-37062
- Electrostatic probe measurement in flowing NaK seeded Ar closed cycle MHD generators
p0132 A68-37310
- Electrode and boundary layer temperature effects on MHD generator performance, investigating energy transfer from working fluid to external load
p0132 A68-39715
- Two terminal operation of diagonal connecting wall /DCW/ and Hall MHD generators under identical gasdynamic channel entrance conditions and magnetic field configurations
p0132 A68-39717
- Hall voltage reduction in linear MHD generators noting Lorentz force effect
p0133 A68-39722
- Traveling wave MHD induction generator with variable fluid velocity having rotating machine internal electrical efficiency
[JPL-TR-32-1328] p0133 A68-39723
- Open cycle MHD generators optimization, predicting thermodynamic properties, electrical loading, etc
p0133 A68-39724
- Diagnostic techniques for determining MHD generator plasma electron density, conductivity, gas and electron temperature, velocity and Hall coefficient
p0133 A68-39726
- High effective electrical conductivity and power densities in closed cycle MHD power generation, considering effect of local nonequilibrium ionization
p0133 A68-40538
- MHD power generator using nonequilibrium plasma generated by inductively coupled RF electric fields, noting plasma diagnostic techniques
p0133 A68-41161
- Throttling effect on thermodynamic efficiency of MHD generator Rankine cycle with various working fluids
p0134 A68-41271
- Closed-loop cycle converter, composed of MHD generator and compressor consuming thermal energy, exhibiting moderate cycle efficiency decreases
p0134 A68-41272
- Book on MHD energy conversion covering conductivity, fluid mechanics, thermal and nonequilibrium ionization, Hall effect, aerospace applications, etc
p0134 A68-42500
- MHD power generation, commercial and space applications and potential thermal pollution reduction
p0138 A68-42581
- Liquid metal MHD power generation, discussing high magnetic Reynolds number direct AC induction generator, power cycles and operations
p0138 A68-42582
- MHD induction generators, discussing constant and variable velocity generators, velocity distribution, boundary layer losses, etc
p0138 A68-43067
- Constant velocity Hall type MHD generators, analyzing steady state operating characteristics and stability
p0138 A68-43068
- Electrode processes effects in MHD generators, using mathematical model
p0139 A68-43071
- Annular induction MHD generators, giving input and output densities, electrical conversion efficiency, etc
p0139 A68-43072
- MHD technology applications to industry and cost and performance of MHD generators
p0139 A69-11394
- Inert gas nonequilibrium MHD power generation in shock tube
p0140 A69-12825
- MHD generator two dimensional analysis for studying edge effect, taking into account Hall effect
p0140 A69-14099
- MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0140 A69-14152
- Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization
p0140 A69-14154

- Temperature drop in combustion chamber of open cycle MHD power plant due to added potassium carbonate as function of various parameters
p0140 A69-14162
- Soviet collection of papers on MHD method of obtaining electrical energy, noting plasma properties in MHD generators
p0141 A69-17905
- Potassium seeded argon plasma conductivity in induced electric field at static gas temperature for MHD generator model
p0141 A69-17909
- Thermodynamic cycle and optimum conditions of electric power source of MHD generator in combination with thermocompressor
p0142 A69-21592
- Optimum operation modes of MHD converter
p0142 A69-23095
- O shaped magnetic systems using unsaturated steel magnetic circuit to produce strong uniform magnetic fields for MHD machines
p0143 A69-23102
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 1, Closed cycle MHD with gaseous working fluids
p0001 A69-23433
- Ar-K plasma studied as possible MHD generator working fluid by investigating influence of emission and external magnetic field on nonequilibrium electrical conductivity
p0143 A69-23441
- Argon discharges in metal capillary cathodes noting effects of electron density, flow velocity, electrode phenomena and gas temperature
p0143 A69-23450
- Induced magnetic fields determination in linear DC MHD generators with ferromagnetic and nonmagnetic walls, using Fredholm equation
p0143 A69-23454
- Instabilities in K seeded Ar plasma in crossed electric and magnetic fields and with nonequilibrium ionization, noting effects on MHD generator characteristics
p0143 A69-23457
- Mercury cesium plasma in crossed electric and magnetic fields as working fluid of MHD generators based on Rankine cycle
p0143 A69-23458
- Turbulent plasma near stability limit in MHD generator with constant load coefficients, noting effective conductivity and effects of gas temperature
p0144 A69-23460
- Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance
p0144 A69-23463
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 2, Closed cycle MHD with gaseous working fluid
p0093 A69-23464
- Linear nonequilibrium MHD generator operating at Mach 2 and Hall parameter of 3 using cesium seeded helium as working fluid
p0144 A69-23471
- Large disk MHD generator operating at high Hall coefficient and driven by cesium seeded argon or molecular gases
p0144 A69-23473
- MHD conversion experiments using rare gas, considering Typhée loop, electron heating and correction effects
p0144 A69-23475
- Closed cycle MHD experiments with applied electric and magnetic fields emphasizing current leakage, segmentation, relaxation and aerodynamic effects
p0145 A69-23479
- MHD generator performance operating on nonequilibrium Ar plasma with K additions in presence of electric fields
p0145 A69-23480
- Closed loop magnetoplasma dynamic energy conversion system design, operation and duct section
p0145 A69-23483
- Impulse induction MHD generator with cylindrical channel, finding differential equations for velocity and current
p0145 A69-23484
- Striated flow induction synchronous MHD generator, producing striated flow by nonthermal ionization of inert seeded gas in electric field
p0145 A69-23487
- Experimental arrangement consisting of closed cycle system, ionization duct and inductive MHD converter with traveling wave component, using Bq as working medium
p0146 A69-23490
- Gaseous suspensions of thermionic emitting particles assessed as MHD working fluids in large scale MHD electric power generators
p0146 A69-23491
- MHD power plant research and development, discussing shock wave electric power generators and modulated systems
p0146 A69-24469
- Current and voltage distribution around normal shock in MHD duct using conformal transformation, considering continuous and segmented electrode boundary conditions
p0146 A69-25359
- Faraday type MHD energy converters in nonequilibrium conduction mode, analyzing two dimensional current and potential distributions in plane normal to magnetic field
p0146 A69-25397
- Constant and traveling magnetic fields MHD converters induction and finite dimensions influence analyzed by conformal mapping, separation, Fourier and finite difference methods
p0147 A69-25399
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 5, Open-cycle MHD
p0004 A69-27468
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 3, Closed cycle MHD with liquid-metal working fluids
p0004 A69-27474
- Two phase MHD generator with gas in liquid metal emulsions, discussing loops efficiency
p0147 A69-27479
- Energy conversion with liquid metal working fluids in MHD generators, discussing single stage fully Carnotized process
p0147 A69-27482
- Thermal efficiencies of liquid-metal MHD generator cycles, analyzing optimum parameters, working fluid and partial irreversibilities
p0148 A69-27484
- Liquid metal two phase flow MHD generators efficiency prediction, discussing end losses and flow velocity
p0148 A69-27485
- Optimal cycle parameters for liquid metal single component MHD cycle, employing condensing ejector in front of generator
p0148 A69-27488
- Liquid metal MHD generator cycles thermodynamic analysis, considering multicycle operation improvement with heat regeneration
p0148 A69-27489
- Piston-like laminar liquid metal flow in MHD generator to increase thermodynamic efficiency of cycle and to generate electricity by synchronous principle
p0148 A69-27491
- Liquid-metal MHD space power generation system using intermittent vaporization slugs shooting at 2700 R peak temperature
p0149 A69-27492
- One dimensional calculations of finite length MHD uniform traveling wave induction generator, discussing magnetic field distribution, electrical impedance and conversion efficiency
p0149 A69-27494
- Liquid flow MHD alternating current generator design, considering induced current in rotor and resulting magnetic field in pole gap
p0149 A69-27495
- MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters
p0149 A69-27499

- Variable fluid and field velocity HF induction generator, determining interaction between fluid dynamic forces and magnetic field and kinetic energy
p0150 A69-27502
- Liquid metal MHD induction generators design and performance, considering effect of geometry, operating conditions, fluid properties and power level on efficiency
p0150 A69-27503
- Single wavelength design with compensation compared to multiwavelength design without compensation for liquid metal MHD induction converter, discussing optimization
p0150 A69-27504
- Linear inductive MHD converters, reducing effects of losses due to finite length of converter by cylindrical construction
p0150 A69-27505
- Transient response in liquid-metal conduction MHD generators, analyzing constant magnetic field using differential equation
p0150 A69-27506
- Rayleigh-Taylor instability in synchronous liquid metal MHD generators, showing stabilization by channel positioning and threshold power rating
p0150 A69-27508
- Liquid metal induction MHD generator I-V characteristics at no load permitting self excitation with capacitors
p0151 A69-27509
- Sodium liquid-metal jet MHD generators tested under constant and rising magnetic fields and off and on loads
p0151 A69-27511
- Induction, helical and straight through liquid metal MHD generators tested under independent and self excitation conditions
p0151 A69-27512
- Three phase high temperature liquid metal induction MHD generator performance, noting velocity profile nonuniformity influence
p0151 A69-27513
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 4, Open cycle MHD
p0006 A69-28021
- Ideal MHD induction converter pressure and generator cycles compared for calculating maximum output and pressure, considering current-conducting walls effects
p0151 A69-28887
- MHD generator design with electric conductivity waveform at small magnetic Reynolds numbers
p0156 A69-29911
- Thermodynamic parameters of MHD cycle employing supercritical Hg, indicating need for more suitable fluids
p0156 A69-31914
- Two dimensional numerical solution for Faraday DC MHD generators with variable conductivity, velocity and magnetic field
p0157 A69-39027
- DC MHD generator using gas plasma as working fluid, discussing fundamental principle, components interactions and energy conversion
p0157 A69-39165
- Superconducting magnets for MHD generators, discussing design, construction and operation problems
p0157 A69-39478
- MHD energy converters electric fields and current distributions, analyzing MHD flow problems
p0157 A69-39480
- MHD generators physical phenomena, discussing thermal efficiency, inlet parameters, operating principles, etc
p0163 A70-14716
- MHD generators developments, considering open and closed cycle systems and commercial power networks applications
p0163 A70-14754
- [ASME PAPER 69-WA/PWR-12] MHD generator cathode current-sheath voltage characteristics for thermionic arc spot emission mode, noting role of cathode temperature
p0163 A70-14797
- [ASME PAPER 69-WA/HT-51] Critical Hall parameter indicating instability in alkali-seeded noble gases in nonequilibrium MHD generators
p0163 A70-18107
- Electrical effects of boundary layers on insulator wall of MHD generator, considering equilibrium and nonequilibrium ionization generators performance
p0164 A70-19321
- MHD generators optimum load selection by method of stepwise approach, noting agreement with pressure and density distributions to yield maximum power
p0164 A70-24156
- Optimal MHD generator with constant channel area, assuming small Reynolds numbers and ideal inviscid gas with arbitrary electrical conductivity
p0164 A70-24570
- MHD generator with generator channel consisting of two coaxial cylinders with smooth annular space, discussing internal impedance sensitivity
p0165 A70-24855
- Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc
p0165 A70-25525
- NASA-Lewis closed loop MHD low temperature power generator, describing systems performances during subsonic tests
p0165 A70-25614
- Mechanical electromagnet model of MHD dynamo achieving direct conversion of mechanical to magnetic field energy
p0166 A70-28654
- MHD induction generator efficiency, investigating winding slot finite spacing and width effects
p0166 A70-30531
- Open cycle MHD generator operation, comparing below stoichiometric air-fuel ratios to excess air level
p0166 A70-30534
- MHD power generation, investigating replenishment of zirconia electrodes from plasma in open flame and duct configurations
p0166 A70-30535
- MHD power sources for onboard military aircraft electrical application
p0167 A70-33474
- Liquid metal MHD conservation cycles, discussing evolution and status of power generation at various temperatures
p0167 A70-39325
- Plasma inhomogeneities effects on MHD generators I-V characteristics, energy conversion efficiency and optimum duct geometry
p0167 A70-39636
- Liquid metal MHD power conversion system with Cs and Li as working fluids, describing hydraulic, electrical and high temperature tests results
p0167 A70-39986
- MHD induction generator design, considering electrical and friction loss measurement and control
p0167 A70-39988
- Preionization in Cs seeded Ar nonequilibrium plasma for MHD generators, examining discharge characteristics, recombination reactions, etc
p0168 A70-39991
- Combustion driven Hall configuration MHD generator, discussing boundary layer analysis, gas density nonuniformity and electrode drop
p0168 A70-40003
- Performance comparison of diagonal conducting wall MHD generator and Hall generator of equal dimensions, investigating wall temperature effect
p0169 A70-40004
- Electrode size effects on combustion driven MHD generator performance, examining voltage losses, gas boundary layer temperature and surface conditions
p0169 A70-40005
- NASA Lewis closed loop MHD generator subsonic tests, discussing ducts, purge and Cs injection systems, electrode coating, etc
p0169 A70-40011
- Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties
p0169 A70-40012

- Conducting wall MHD generator channel current distribution, examining computer program for anode and cathode currents p0169 A70-40013
- One wavelength MHD induction generator, discussing field pressure gradients, fluid velocities, excitation and electrical output power p0169 A70-40015
- Optimal load circuits number for maximum power extraction from Hall MHD generator with nonuniform gas flow along channel p0170 A70-44900
- NERVA reactor technology applied to closed Brayton cycle MHD power system [AIAA PAPER 70-1225] p0170 A70-45956
- Book on direct energy conversion principles and methods covering fusion, fuel cells, MHD, thermoelectric, thermionic, photovoltaic, electrohydrodynamic, piezoelectric and ferroelectric power generation p0171 A71-11193
- Transverse current leakage effect on energy conversion and Hall characteristics of MHD generator p0171 A71-12195
- Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products p0172 A71-22136
- Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output p0172 A71-23441
- Soviet book on thermionic and MHD energy conversion covering gas ionization, converter operation and low temperature plasma physics p0172 A71-26099
- Linear nonequilibrium shock tunnel driven supersonic MHD generator operation under large scale power extraction and strong electromagnetic-rare gas interactions p0172 A71-29879
- Electrode size effects on voltage loss and boundary layer conductivity of combustion driven MHD generator p0173 A71-29880
- Pulsed MHD generator model with nonequilibrium plasma, obtaining I-V characteristics p0174 A71-35273
- Combustion oscillator for MHD energy conversion, using products flow modulation by traveling pressure wave p0175 A71-38099
- MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid p0176 A71-40620
- Optimal conditions for energy conversion in MHD generator, observing ion seeding effect on plasma temperature p0177 A72-11257
- NASA closed cycle MHD facility for power generation, discussing system components, design and operation [AIAA PAPER 72-103] p0177 A72-16936
- Self regenerating molten seed electrodes for open cycle MHD power generators longevity, regulating combustion chamber and gas flow seeding p0178 A72-18336
- Performance characteristics and limitations of electrode and insulation materials for open and closed cycle MHD generators, noting ceramic compositions for channel [AD-737419] p0178 A72-22401
- Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakages and current distribution p0179 A72-29353
- Ionization turbulence effect on nonequilibrium plasma MHD generator performance, using I-V characteristics equation p0179 A72-29354
- MHD power generators analytical modeling by digital technique for prediction of performance and efficiency as function of size and operating conditions [AD-741173] p0179 A72-29355
- Thermal-to-electric power conversion efficiency of nonequilibrium MHD generator with Cs seeded noble gases, considering electrode configuration and gas dynamic effects p0179 A72-29356
- One-wavelength MHD induction generator operated on NaK flow system with various excitation conditions, calculating magnetic flux density and power by Fourier series p0179 A72-29364
- Numerical analysis method for performance prediction of linear induction machines including liquid metal MHD pumps and generators and linear motors p0179 A72-29365
- Effect of heterogeneity and Hall current on the MHD power generator. p0182 A73-10434
- Analysis of optimal conditions for energy conversion in an MHD-generator channel p0182 A73-16586
- Large-scale applications of superconducting coils. p0183 A73-20107
- Hall current effects in the Lewis magnetohydrodynamic generator. p0184 A73-22823
- Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion. p0184 A73-22829
- Optimal, elliptic and circular windings for superconducting nonferrous magnetic MHD generators, comparing cross sections p0185 A73-24594
- Qualitative analysis of MHD energy conversion efficiency p0186 A73-27321
- Nonequilibrium ionization in magnetohydrodynamic conversion generators p0186 A73-28071
- Engineering aspects of magnetohydrodynamics; Proceedings of the Thirteenth Symposium, Stanford University, Stanford, Calif., March 26-28, 1973. p0188 A73-38310
- NaK-nitrogen liquid metal MHD converter tests at 30 kW. p0188 A73-38311
- Exploratory study of several advanced nuclear-MHD power plant systems. p0189 A73-38411
- Experimental investigation of the characteristics of a nonequilibrium MHD generator p0190 A73-39618
- Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition p0190 A73-39619
- Plasma core reactor and inductive magnetohydrodynamic converter for power generating system [DLR-FB-67-59] p0191 N68-11139
- Current distribution in magnetohydrodynamic generators with two pair of finite length electrodes separated by isolated sections p0192 N68-11664
- Nonequilibrium ionization in potassium gas magnetohydrodynamic generator [AI-67-138] p0192 N68-11928
- Liquid metal stream acceleration by same metal vapor for application in magnetohydrodynamic generator [ANL-TRANS-508] p0192 N68-12691
- Magnetohydrodynamic generator design trends [PTD-HT-66-378] p0192 N68-13094
- Direct current and electrodeless induction type magnetohydrodynamic power generators using liquid metals as working media optimized by means of variational calculus [DLR-FB-67-71] p0193 N68-14746
- Electromagnetic processes in magnetohydrodynamic induction machines with working media of liquid metal [NASA-TT-P-460] p0194 N68-16286
- Magnetohydrodynamic induction generators with liquid metal working media, and electromagnetic field structures p0194 N68-16287

SUBJECT INDEX

MAGNETOHYDRODYNAMIC GENERATORS CONTD

- Electromagnetic processes in conduction band of traveling magnetic field of flat inductor in magnetohydrodynamic machines p0194 N68-16288
- Higher spatial harmonics of magnetic field in induction magnetohydrodynamic generator p0194 N68-16289
- Transverse edge effect in plane induction magnetohydrodynamic generators p0194 N68-16290
- Longitudinal edge effect in linear induction magnetohydrodynamic generators p0194 N68-16291
- Ponderomotive forces acting upon conductive bodies in traveling magnetic field of cylindrical inductor, and effect on magnetohydrodynamic generator design p0195 N68-16292
- Open and closed cycle magnetohydrodynamic generators for energy conversion systems p0197 N68-17810
- Nonequilibrium modes of operation for magnetohydrodynamic energy converters p0197 N68-17811
- Nonequilibrium electron mode for kilowatt range magnetoplasma dynamic generation of space power p0197 N68-17812
- Design criteria for Rankine magnetohydrodynamic generators in space applications [NASA-TM-X-52191] p0200 N68-19019
- Design and construction of ARGAS experimental magnetohydrodynamic generator at nuclear research facility Juelich, Germany [JUL-510-TP] p0201 N68-21331
- Thermomagnetic and thermoelectric effects used to improve energy conversion efficiency of thermodynamic cycles [DGLB-68-005] p0201 N68-22013
- Combustion-driven magnetogasdynamic power generator designed to obtain direct current electric power generation data under thermal steady state conditions p0202 N68-23346
- Pollution free hybrid fossil nuclear fueled magnetohydrodynamic power cycle [BNL-12319] p0202 N68-26381
- Principles, characteristics, and technology development status of conversion systems for converting reactor heat into space electric power [NASA-TM-X-52472] p0204 N68-29921
- Phase impedance, power factor, performance characteristics, and working fluids studied for magnetohydrodynamic generators p0204 N68-29990
- Fringing losses and efficiency of finite length magnetohydrodynamic traveling wave cylindrical accelerator or generator p0204 N68-30018
- High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters [NASA-TT-P-11825] p0205 N68-30811
- One dimensional calculations on finite length magnetohydrodynamic induction generator [UCRL-70795] p0205 N68-31910
- Research studies in plasma physics, thermonuclear reactions, and magnetohydrodynamic generators [AFOSR-68-1377] p0206 N68-31928
- Magnetohydrodynamic generators with unbalanced conductivity and ionization instability [PTD-MT-24-205-67] p0206 N68-35442
- Gas dynamics of supersonic radial nozzles for magnetohydrodynamic generators [PTD-MT-24-209-67] p0206 N68-35663
- Closed loop facility designed to study MHD generator using argon-cesium working fluid [NASA-TN-D-4867] p0207 N68-37259
- Research and advanced concepts - laminarization in nozzle flow, liquid metal magnetohydrodynamic power conversion, swirling and nonswirling gas flow, magnetic field effects in square channel p0207 N68-37410
- Electrode geometry effect on current and potential in magnetohydrodynamic generators [IPP-3/68] p0207 N68-38458
- Hybrid fossil nuclear fueled MHD power cycle characteristics [BNL-12569] p0082 N69-11230
- Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities [JPRS-46752] p0208 N69-11943
- Thermodynamic properties of liquid metal cycle in magnetohydrodynamic power generator with heat regeneration p0208 N69-11944
- Construction and operation of magnetogasdynamic power generation facility [NASA-CR-72477] p0208 N69-12307
- Single component closed loop, liquid potassium magnetohydrodynamic generator [NASA-CR-97883] p0209 N69-13045
- Acceleration devices for liquid metal magnetohydrodynamic generators [NASA-CR-97885] p0209 N69-13151
- Electrical conductivity of two phase liquid metal flow in magnetohydrodynamic generator [NASA-CR-97872] p0209 N69-13240
- Injector characteristics using wet steam in connection with magnetohydrodynamic generator applications [NASA-CR-97878] p0209 N69-13286
- Experimental results on two phase supersonic nozzle used in liquid metal magnetohydrodynamic generators [NASA-CR-97877] p0209 N69-13287
- Liquid metal magnetohydrodynamic generator hydraulic losses and duct flow [NASA-CR-97879] p0209 N69-13288
- Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics [AD-674611] p0012 N69-13314
- Study of metallic and ceramic electrodes in MHD generator [SM-74/62] p0210 N69-13315
- Optimization of constant current electromagnet in MHD generator [SM-74/83] p0210 N69-13317
- Nonequilibrium conductivity of plasma in MHD generator [SM-74/104] p0210 N69-13324
- Experimental results of 100 kW MHD generator [SM-74/212] p0210 N69-13325
- Effectiveness of enriching air with oxygen in installations with MHD generators [SM-74/201] p0211 N69-13327
- Effect of output on thermal efficiency in electric power stations using MHD generators [SM-74/204] p0211 N69-13329
- Experimental investigation of MHD generator [SM-74/206] p0211 N69-13331
- Volt-ampere characteristics of MHD channel with different electrodes [SM-74/209] p0211 N69-13332
- Electrical parameters of synchronous MHD generator with pulsating electrical conductivity of incompressible fluid [SM-74/210] p0211 N69-13333
- Composition and thermodynamic properties of combustion products of methane and air-oxygen [SM-74/217] p0082 N69-13334
- Thermodynamics of two component liquid metal MHD power plant with vapor-liquid injector [SM-74/218] p0212 N69-13335
- Problems in operating MHD generator installation [SM-74/221] p0212 N69-13336
- Transient processes in superconducting magnets in MHD generators [SM-74/229] p0212 N69-13341
- Electrical conductivity of plasma in MHD generator [SM-74/236] p0213 N69-13346
- Applicability of electrodynamic approximation in theory of liquid metal MHD energy converters [SM-74/240] p0213 N69-13348
- Determining dimensions of MHD channel [SM-74/242] p0213 N69-13350
- Wall effect in MHD channels with segmented electrodes [SM-74/248] p0213 N69-13352
- Generation of electric power by liquid sodium-jet MHD generator [NASA-CR-97864] p0214 N69-13391
- Ionospheric MHD generator based on utilizing solar energy [JPRS-46941] p0214 N69-13670

- Construction and performance tests of induction type liquid potassium magnetohydrodynamic generator
[NASA-CP-97876] p0214 N69-13818
- Electric field in magnetohydrodynamic channel of rectangular section with semiterminal electrodes
[NASA-TT-P-12010] p0214 N69-14070
- Hollow cathode operation and plasma discharge in mercury ion engine, potential distribution of glow discharges, and liquid metal MHD power conversion
p0214 N69-16485
- Comparison of Brayton and Rankine cycle magnetohydrodynamic space power generation systems for use with nuclear heat source
[NASA-TN-D-5085] p0217 N69-20852
- Electron temperature instabilities in entrance region of magnetohydrodynamic generator
[NASA-TN-X-1761] p0217 N69-20875
- Hall magnetohydrodynamic generators instability to magnetoacoustic waves
[RR-323] p0217 N69-21275
- Numerical analysis of multistage liquid metal magnetohydrodynamic power conversion cycle
[NASA-CR-100500] p0217 N69-21376
- Design of magnetohydrodynamic induction machine with end poles which produce compensating magnetic fields
[NASA-CASE-XNP-07481] p0218 N69-21929
- Comparison of magnetic systems for producing large scale magnetohydrodynamic generators
[AD-683989] p0219 N69-26189
- Calculation of boundary layer at electrode of MHD generator
p0219 N69-26243
- Laminar flow of liquid metals in channel of magnetohydrodynamic generators
[AD-680712] p0220 N69-26620
- Electrode temperature effect on MHD generator performance
[AD-683793] p0220 N69-27071
- Processes occurring in duct of open cycle magnetohydrodynamic generator
[AD-683131] p0220 N69-27397
- Magnetohydrodynamic power generator development for commercial application
p0221 N69-28597
- Linear approximation of finite length magnetohydrodynamic induction converter
[UCRL-50537] p0221 N69-28635
- Boundary layer influence and other effects on magnetohydrodynamic generator electrical characteristics
[AD-685536] p0221 N69-29842
- Optimum geometric relationships in coaxial linear induction magnetohydrodynamic generator
[AD-685523] p0221 N69-29843
- Piston-type flow for regulating distribution instability in liquid metal synchronous magnetohydrodynamic generator
[AD-685487] p0221 N69-29892
- Electrical behavior of various magnetohydrodynamic generators using explosives
[CEA-R-3714] p0222 N69-30078
- Magnetohydrodynamic generation of electricity by means of liquid metals using two phase flow
[TH-69-E-06] p0222 N69-31249
- References on magnetohydrodynamic generators
[AD-686000] p0222 N69-32347
- Present stand and potential use of MHD generators for electric power production
[FOA-4-C-4325-55] p0223 N69-35224
- Magnetic systems using steel for magnetohydrodynamic generators
[AD-688393] p0224 N69-35280
- Physical model for behavior of thermionic arc spots on MHD generator cathode
[NASA-TN-D-5414] p0224 N69-35732
- Thermodynamic analysis of supercritical mercury heat engine and magnetohydrodynamic generator
[AE-355] p0224 N69-35785
- Nuclear seeded magnetohydrodynamic plasmas for electron kinetics using helium 3
[AD-690542] p0225 N69-39863
- Magnetohydrodynamic generator for mixing nonconductive gas and liquid metal mist to form slugs
[NASA-CASE-XLE-02083] p0225 N69-39983
- Large scale nonequilibrium magnetohydrodynamic generator
[AD-693153] p0226 N70-11420
- Integral characteristics of MHD generator with diverging electrodes
[AD-694396] p0227 N70-13251
- Molybdenum electrode size effect on performance of magnetohydrodynamic generator
[AD-694039] p0228 N70-14933
- Research program to determine bulk properties of plasmas in MHD disk generator driven by high temperature, large mass flow, alkali shock tunnel
[AD-694529] p0228 N70-15650
- Principles of operating magnetohydrodynamic power generators
p0229 N70-18728
- Gas parameters in ideal magnetohydrodynamic generators with infinite electrode segmentation
[IPP-3/97] p0230 N70-21895
- Experimental and analytical comparison for 20 MW combustion-driven Hall configuration MHD generator
[RR-344] p0231 N70-24132
- Magnetohydrodynamic problems in transformation of energy
[AD-699661] p0231 N70-25577
- Magnetoplasmadynamic converters with mercury vapor and argon
[DLR-FB-69-85] p0232 N70-26208
- Magnetohydrodynamic pumps and generators
p0232 N70-28078
- Development of plasma diagnostic methods applied to direct energy converters
[AD-702405] p0233 N70-29012
- Design and tests of MHD induction generator operating on liquid flow
[NASA-CR-110154] p0233 N70-29169
- Electrical resistivity of liquid lithium saturated with cesium
[NASA-CR-110370] p0233 N70-29729
- Measurements of potential and current density distributions in simulated Faraday-type MHD generator working with argon-potassium plasma
[IPP-3/104] p0234 N70-31285
- Large linear, supersonic MHD generator with rare gases
[AD-703314] p0234 N70-31999
- Comparative performance analysis of linear MPD generators
[TUBIK-15] p0234 N70-32771
- Diagonal conducting wall generator and Hall generator performance
[AD-705159] p0235 N70-32986
- Efficiency of power production in MHD generators with nonequilibrium plasmas
[IAE-1701] p0235 N70-33216
- Electrical parameter calculation for magnetohydrodynamic generator with variable gas parameters along channel axis
[INR-1107] p0235 N70-33335
- Gas velocity and temperature distribution effects on electrical parameters of Faraday-type MHD generator
[INR-1095] p0235 N70-33547
- Electrical parameters in Faraday-type MHD generator with nonuniform gas properties in electric field direction
[INR-1096] p0235 N70-33672
- Ionization instability in disk channel of unbalanced MHD generator, MHD generator boundary layer wall equations, and variational problems of magnetohydrodynamics
[AD-705748] p0235 N70-34959
- Developing magnetohydrodynamic generators for production of electrical energy
p0236 N70-36136
- Developing magnetohydrodynamic generators for production of electrical energy
p0236 N70-36137
- Electrical conductivity of plasma on magnetohydrodynamic generator, and spectroscopic analysis of argon and cesium plasma
[AD-703158] p0236 N70-36408
- Thermoelectric power conversion by liquid metal flowing through magnetic field
[NASA-CASE-XNP-00644] p0236 N70-36803
- Installations for direct conversion of heat into electrical energy by MHD generators and other energy devices
p0236 N70-37070

- MHD methods of obtaining electrical energy
[AD-706160] p0236 N70-37638
- Research and development of superconducting magnetic systems for MHD generators using Nb-Ti alloys
[AD-706779] p0237 N70-37715
- Optimization of linear nonequilibrium MHD generator
[AD-707893] p0237 N70-40031
- Development of cesium seeding techniques, large MHD magnets, plasma diagnostic techniques, and thermionic electrodes compatible with shock tube MHD generators
[AD-711351] p0238 N71-10992
- Analysis of magnetoplasmadynamic converters
[AEC-TR-7161] p0239 N71-15010
- Crossed field MHD plasma generator-accelerator
[NASA-CASE-XLA-03374] p0239 N71-15562
- Magnetic induction concentric cylinder magnetohydrodynamic generator with cryogenic cooling
[DLB-FB-70-25] p0240 N71-17840
- Performance tests of liquid metal magnetohydrodynamic power converter
[AD-711351] p0241 N71-22560
- Comparison of turbo-MHD cycle with Brayton-MHD and turboelectric cycles
[NASA-TN-X-67829] p0241 N71-24578
- Operating characteristics of large nonequilibrium MHD generator with cesium seeded noble gases and heated electrodes
[AD-719381] p0241 N71-24680
- MHD energy conversion using Joule heating
[AD-720257] p0241 N71-26190
- Magnetohydrodynamic generator systems analysis including electrical impedance and power conversion efficiency calculations for various designs
[AD-721454] p0241 N71-26449
- Engineering aspects of magnetohydrodynamics
[AD-720257] p0241 N71-26458
- Numerical calculations of electrical parameters in Faraday-type MHD generator with two dimensional gas flow
[INR-1199] p0241 N71-27207
- Design parameters of noble gas magnetohydrodynamic generator for nuclear power plant
[JUL-706-TP] p0242 N71-27918
- Signal analysis and power spectral density of fluctuations in series connected open cycle MHD generators
[AD-721454] p0242 N71-28680
- Evaluation of factors affecting performance of series connected magnetohydrodynamic generators
[AD-721455] p0242 N71-28718
- Design and component analysis of future magnetohydrodynamic nuclear power plants
[JUL-689-TP] p0242 N71-30458
- Microwave ionization for obtaining nonequilibrium plasma in MHD generators
[NASA-TT-F-13783] p0242 N71-32212
- Uranium plasmas applied to nuclear rocket engines, MHD generators, nuclear lasers, and plasma stability and flow - conference
[NASA-SP-236] p0242 N71-33626
- Gaseous fission, closed loop, MHD generator in nuclear electric power plant
[AD-721454] p0243 N71-33632
- Magnetohydrodynamic generator development and applications in radiating power plants, propellant-cooled propulsion systems, and industry
[AD-721454] p0243 N71-33661
- Performance of helium seeded with uranium in magnetohydrodynamic generator
[AD-721454] p0243 N71-33663
- Gas core reactors and MHD generator to solve problems of growing demand for electric power without thermal pollution
[AD-721454] p0243 N71-33664
- Chemical, X ray diffraction, electron microscopic, and structural analysis of silicon carbide ceramics for open cycle magnetohydrodynamic generators
[AD-721454] p0243 N71-35623
- Development and evaluation of oxide electrode materials for use with open cycle magnetohydrodynamic generator
[AD-721454] p0243 N71-35627
- Development of combined turbine-magnetohydrodynamic generator operating in Brayton cycle with NERVA nuclear reactor for space and ground applications
[NASA-TN-D-6513] p0244 N71-36450
- Energy balance relationships used for evaluating maximum parameters of MHD generator operating on nonequilibrium plasma
[AD-726588] p0244 N71-37309
- Status of MHD power generators and related technology in Japan
[AD-727094] p0244 N71-38510
- Efficiency of electric power production on MHD generators in nonequilibrium plasma
[AD-724973] p0245 N72-10782
- MHD generator for measuring conductivity of hydrocarbon-oxygen combustion gases seeded with cesium salts
[AD-725739] p0245 N72-11065
- Effects of nonuniform gas flow on electrical performance of MHD generators
[AEC-TR-7102/3] p0245 N72-11610
- Electrical losses in MHD generator described from separation of flow system
[JUL-742-TP] p0245 N72-11639
- Generation of MHD power with cesium seeded inert gas through use of nonequilibrium ionization
[NASA-TN-X-67975] p0246 N72-12166
- Development, characteristics, and operation of linear, nonequilibrium magnetohydrodynamic generator
[AD-728407] p0246 N72-13211
- Model study of magnetohydrodynamic generator using argon-potassium plasma
[AD-728591] p0246 N72-13698
- Proceedings of conference on magnetohydrodynamic electrical power generation
[AD-730450] p0247 N72-15235
- Gaseous nuclear fuel for gas reactors and magnetohydrodynamic plants
[JPRS-55126] p0247 N72-17956
- Application of explosive driven magnetohydrodynamics for producing pulses at multimegajoule levels
[AD-735660] p0247 N72-21497
- Effect of wall friction on magnetohydrodynamic generator performance determined by introduction of wall friction factor into one-dimensional generator equations
[NASA-TN-D-6804] p0247 N72-24755
- Vibrational excitation of nonequilibrium magnetohydrodynamic generator
[AD-740572] p0248 N72-29734
- Design and performance of one wavelength magnetohydrodynamic liquid flow induction generator
[NASA-CR-127891] p0249 N72-30655
- Circuit substitution and calculation procedure for determining influence of boundary layer on MHD generator electrical characteristics
[AD-745245] p0249 N72-33063
- Development of superconducting magnet system for magnetohydrodynamic power generation
[AD-745321] p0249 N73-10247
- MHD parameter optimization procedure for determining optimum coil geometry for 10 MW level superconducting magnet system
[AD-745322] p0250 N73-11717
- MHD power systems with potential high efficiencies of constant liquid velocity, two phase, liquid metal dc MHD generator
[AD-747323] p0250 N73-12064
- Performance of closed cycle MHD generators
[AD-747661] p0250 N73-12068
- Research on closed cycle MHD power generation for converting heat into electricity
[RT/ING-(71)20] p0250 N73-12784
- Pulsed ionization chamber for plasma diagnostics, and applications to MHD electrical power generation from gas cooled reactors
[AD-747681] p0250 N73-12800
- Basic physical processes in thermionic and magnetohydrodynamic converters of thermal energy into electrical energy
[AD-748707] p0250 N73-13061
- Aerospace MHD large scale power generation
[AD-748707] p0250 N73-13865

- Experimental investigations of two-dimensional flow problems and electric power generation in open cycle vortex MHD generator
[BM-RI-7699] p0251 N73-14746
- Theoretical and parametric study of inductive magnetohydrodynamic converters including design of cryogenic experimental 4 kW converter
[DLR-FB-71-74] p0251 N73-15757
- Test facility for combustion flow in open cycle magnetohydrodynamic generator
[AD-751251] p0251 N73-16036
- Principles of magnetohydrodynamic energy generation to include flows in magnetohydrodynamic generator, physical processes, diagnostics, and required equipment - Part 1
[JPRS-57940-1-PT-1] p0251 N73-16687
- Principles of magnetohydrodynamic energy generation to include open and closed cycle magnetohydrodynamic generators, liquid-metal plants, and materials for generators - Part 2
[JPRS-57940-2-PT-2] p0251 N73-16688
- Viscous incompressible fluid hydraulics of magnetohydrodynamic generators
[AD-751465] p0252 N73-16718
- Mathematical model for thermodynamic efficiency of combined power plants incorporating magnetohydrodynamic generators
[AD-753031] p0252 N73-18090
- Development of method for analyzing performance of magnetohydrodynamic generator based on thermodynamic properties and flow characteristics
p0252 N73-15051
- Redesign of Argas 2 facility for using superconducting magnet
[NASA-TT-F-14876] p0252 N73-22662
- Superconductors in marine technology, including coils, solenoids, and magnetic systems
[AD-755711] p0252 N73-22702
- Design, development, and operation of compact, high performance, magnetohydrodynamic generators
[AD-756489] p0253 N73-23765
- Feasibility of potassium-cesium mixture for seeding magnetohydrodynamic combustion plasma
[PB-214314/7] p0253 N73-25102
- Construction and tests of MHD generator channel and electrical power converter
[AD-758783] p0253 N73-25106
- MHD generator performance limitation from electrical properties, including conductivity and Hall parameter
p0253 N73-28655
- Three thermodynamic cycles of advanced nuclear MHD power plant systems
p0253 N73-28657
- Design of MHD generators with fuel gas and air turbine
[JUL-892-TP-VOL-11] p0254 N73-30699
- Explosive magnetohydrodynamic programs
[AD-762934] p0254 N73-30890
- Design of high temperature combustor for use as solid fuel MHD generator and thermodynamic analysis of combustion conditions
[AD-764153] p0254 N73-31848
- Magnetohydrodynamic generator for combined magnetohydrodynamic electric power plant with first generation open cycle
[AD-764925] p0254 N73-31996
- MAGNETOHYDRODYNAMIC STABILITY**
- MHD power generation principles, considering increase of electric conductivity and stability
p0121 A68-17797
- Stability of MHD generator plasma under potential perturbation waves in ionized component of working body
p0121 A68-18285
- Controlled nuclear fusion diagnostics, plasma stability and minimum magnetic field configuration
p0123 A68-20598
- Constant velocity Hall type MHD generators, analyzing steady state operating characteristics and stability
p0138 A68-43068
- Instabilities in K seeded Ar plasma in crossed electric and magnetic fields and with nonequilibrium ionization, noting effects on MHD generator characteristics
p0143 A69-23457
- Turbulent plasma near stability limit in MHD generator with constant load coefficients, noting effective conductivity and effects of gas temperature
p0144 A69-23460
- Critical Hall parameter indicating instability in alkali-seeded noble gases in nonequilibrium MHD generators
[AIAA PAPER 70-40] p0163 A70-18107
- Emission characteristics of refractories and magnetic field influence on current distribution along electrodes - MHD generators
[SM-74/92] p0210 N69-13319
- Hall magnetohydrodynamic generators instability to magnetoacoustic waves
[RP-323] p0217 N69-21275
- Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings
[MAT-659] p0218 N69-23954
- Piston-type flow for regulating distribution instability in liquid metal synchronous magnetohydrodynamic generator
[AD-685487] p0221 N69-29892
- Electrothermal instabilities effects on Brayton and Rankine cycle magnetohydrodynamic space power generation systems
[NASA-TN-D-5461] p0224 N69-37883
- Explaining Tokamak stability by elimination of MHD instabilities when cylindrical Bennett pinch bent into torus
[ORNL-TM-2766] p0230 N70-19953
- Passive circuit grids for stabilization of magnetohydrodynamic generator plasma
[TH-72-E-31] p0253 N73-23757
- MAGNETOHYDRODYNAMIC WAVES**
- Plasma heating by fast hydromagnetic wave, measurements of diamagnetic pressure determine efficiency for RF power conversion into thermal energy
p0122 A68-19492
- MAGNETOHYDRODYNAMICS**
- MHD technology applications to industry and cost and performance of MHD generators
p0139 A69-11394
- Electricity from MHD - Conference, Warsaw, July 1968, Volume 6
p0006 A69-39477
- Rumanian book on MHD covering electromagnetic field theory, motion equations, laminar flow, MHD generators, fluid motion past thin airfoils, shock waves, etc
p0157 A69-41363
- Magnetohydrodynamics - JPL Conference, Pasadena, March 1970
p0168 A70-40001
- MHD - Conference, Argonne, Illinois, March 1972
p0179 A72-29351
- Theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics
[UAPL-31] p0207 N68-37342
- Liquid metal magnetohydrodynamic energy conversion cycles for spacecraft supply
[NASA-TM-X-63671] p0224 N69-37703
- Ionization instability in disk channel of unbalanced MHD generator, MHD generator boundary layer wall equations, and variational problems of magnetohydrodynamics
[AD-705748] p0235 N70-34959
- Magnetohydrodynamic marine engineering
[AD-706643] p0237 N70-38631
- Design, development, and operation of compact, high performance, magnetohydrodynamic generators
[AD-756489] p0253 N73-23765
- MAGNETRONS**
- High efficiency and power long life cross field amplifier generator for solar energy conversion in space into microwave, discussing magnetron and amplatron
p0035 A71-28668
- MAGNETS**
- Electromechanical energy conversion devices using both conventional and rare-earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168

MAINTAINABILITY

Potential in performance improvements in air breathing propulsion related to reliability, maintainability and cost
p0131 A68-33438

MANAGEMENT

Fast breeder reactor design considerations of blanket cycle efficiency and management
p0086 N69-31987

Usefulness of decay rate in radioactive waste stock management
[CEA-R-3731]
p0087 N69-38022

MANAGEMENT PLANNING

Analysis of trend in free world atomic power generation, uranium production, resources, and requirements until 1985
[ORNL-TR-1825]
p0081 N68-28954

Review and description of transferable technologies to near future
[PB-178271]
p0011 N68-31703

Review and comparison of energy forecasts for United States of America
[PB-189938]
p0015 N70-37343

Energy sources in US to achieve future electric energy needs and environmental compatibility requirements
p0095 N71-29852

Management planning in Sweden for natural gas as industrial energy source
[IVA-MEDD-167]
p0096 N71-30522

Application of ERTS-1 imagery to resources management and planning in Ohio
[E73-10987]
p0112 N73-31294

MANNED SPACECRAFT

In-core 100 kWe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base
p0186 A73-26026

Program review on critical areas of technology associated with solar cell battery power systems for manned spacecraft
[NASA-CR-94551]
p0049 N68-23528

MANUALS

Technical reference manual for protective interior liners of petroleum fuel containers
[AD-666969]
p0263 N68-23614

MANUFACTURING

Manufacturing and qualification testing of solar conversion power supply subsystem for Nimbus 4
[NASA-CR-106009]
p0055 N69-38442

Cost estimates for manufacturing hydrogen and oxygen in water electrolysis and fossil fuel plants
p0117 N70-14511

Development and distribution of natural resources to satisfy energy requirements of US industry during the 1970's
[BM-IC-8526]
p0096 N71-36393

Development of relationship between consumption of energy by technological processes and second law of thermodynamics
[NASA-TN-X-65912]
p0019 N72-26971

MAPPING

Gemini space photography applications in petroleum industry, especially for geologists involved in regional mapping or modern environmental research
p0071 A68-30437

Thermal mapping at electrical power generating sites for outfall from fossil or nuclear fuel plants, considering airborne application
p0076 A73-33360

Geological mapping of New York State based on ERTS-A imagery
[E72-10020]
p0101 N72-29272

Mapping ecological effects of coal strip mining in Ohio
[E72-10256]
p0102 N73-12356

Detection, monitoring, and mapping coal strip mining and reclamation in Ohio from ERTS-1 imagery
[E73-10641]
p0107 N73-25338

Geographic analysis and mapping of landscape changes in Tennessee from ERTS-1 imagery
[E73-10661]
p0108 N73-25357

Digital processing of ERTS-1 data for identification of strip mining areas in west branch area of Susquehanna River and mine drainage in Pennsylvania
[PAPER-E3]
p0110 N73-28267

Identification and mapping of coal refuse banks in Pennsylvania anthracite coal fields from ERTS-1 data
[PAPER-L24]
p0110 N73-28319

Mapping of anthracite wastes from mining in Pennsylvania
[E73-11107]
p0112 N73-33264

MARINE BIOLOGY

Oil spill incidents and oil pollution effects on biological systems and earth ecology bibliography
[PB-188206]
p0014 N70-21569

MARINE PROPULSION

Nuclear energy value to society, stressing usefulness for electric power generation and marine propulsion
p0177 A72-14376

Magnetohydrodynamic marine engineering
[AD-706643]
p0237 N70-38631

MARINE TECHNOLOGY
Magnetohydrodynamic marine engineering
[AD-706643]
p0237 N70-38631

MARINER SPACE PROBES

Optimum Mariner spacecraft solar power system models
[NASA-CR-95263]
p0050 N68-27974

MARKET RESEARCH

Market trends and technical progress in small gas turbine engines for general aviation and executive aircraft and helicopters
p0187 A73-34447

MARS ENVIRONMENT

Design concepts for planetary solar array
[NASA-CR-91730]
p0046 N68-14185

MARYLAND

Digital analysis of ERTS-1 data to determine sedimentation levels in Potomac and Anacostia Rivers confluence and strip mining in Allegheny County, Maryland
[PAPER-E13]
p0110 N73-28277

MASS FLOW

Research program to determine bulk properties of plasmas in MFD disk generator driven by high temperature, large mass flow, alkali shock tunnel
[AD-694529]
p0228 N70-15650

MASS FLOW RATE

Calculation of mass flow rate of methane and natural gas through nozzles
[NASA-SP-3074]
p0104 N73-15309

MASS SPECTROSCOPY

Gas chromatography and mass spectrometry applied to porphyrin microanalysis, studying homologous porphyrin series in ancient sediments and oils
p0073 A70-12516

Survey on organic geochemistry origins and use of gas-liquid chromatography and mass spectrometry analyses of organic components isolated from crude oils and sediments
[NASA-CR-93111]
p0079 N68-17316

MATERIALS HANDLING

Aircraft design for transporting arctic crude oil or liquid natural gas, examining air terminal requirements and handling specifications
p0077 A73-41172

Economics and handling nuclear fuel systems for power reactors
[CEA-CONF-1093]
p0257 N69-27096

MATERIALS RECOVERY

The availability and cost of curium-244 from power reactor fuel reprocessing wastes.
p0077 A73-38430

Pilot plant for solvent extraction of strontium 90 from fission products
[EUR-3613.F]
p0078 N68-10864

Titration method for uranium concentration analysis in solutions of irradiated fuel reprocessing plants
[CNEA-192]
p0079 N68-17192

Niobium diffusion process for removing tritium from blanket of thermonuclear reactor
[ORNL-TN-2358]
p0083 N69-19229

Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry
[CONF-680610]
p0087 N69-37355

Mixed fission products potential as thermal and gamma energy sources
[BNWL-1115]
p0224 N69-38506

MATERIALS SCIENCE

SUBJECT INDEX

- Development of minimum and optimum requirements for environmental surveillance programs around nuclear fuel reprocessing plants p0095 N71-29878
- MATERIALS SCIENCE**
- Materials limitations and problems for direct energy conversion methods of thermoelectricity, solar cells, thermionics and fuel cells p0133 A68-41217
- MATHEMATICAL MODELS**
- Solar reflector mathematical model for studying interface between collector and heat receiver, noting error in cavity emitted radiation directional assumption [AGARDOGRAPH 61] p0024 A68-22516
- Thermochemical MHD converter performance determined by slug model governed by differential equations p0130 A68-29901
- Electrode processes effects in MHD generators, using mathematical model p0139 A68-43071
- Shadow effects on current-voltage characteristics of solar cell array circuits, developing mathematical models p0028 A69-35709
- MHD power generators analytical modeling by digital technique for prediction of performance and efficiency as function of size and operating conditions [AD-741173] p0179 A72-29355
- Mathematical model of solar collection limitations for dynamic converters p0087 N68-17795
- Mathematical simulation of solution-gas drive performance of volatile oil reservoir using digital computer p0080 N68-21048
- Computer program and mathematical model for calculating performance characteristics of solar thermoelectric energy conversion plate [NASA-CR-94615] p0049 N68-23987
- One dimensional calculations on finite length magnetohydrodynamic induction generator [UCRL-73795] p0205 N68-31910
- Electrical behavior of various magnetohydrodynamic generators using explosives [CEA-R-3714] p0222 N69-30078
- Numerical calculations of electrical parameters in Faraday-type MHD generator with two dimensional gas flow [INR-1199] p0241 N71-27207
- Two stochastic models for petroleum exploration [NASA-CR-129611] p0103 N73-13992
- MATRICES (CIRCUITS)**
- Fabrication methods for matrices of solar cell submodules [NASA-CASE-YNP-C5821] p0060 N71-11056
- MAXWELL EQUATION**
- MHD generator two dimensional analysis for studying edge effect, taking into account Hall effect p0140 A69-14099
- MEASURING INSTRUMENTS**
- Constant pressure apparatus for measuring oxygen absorption of petroleum hydrocarbons at high temperatures [TG-230-T533] p0079 N68-15844
- Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics p0084 N69-30776
- Computer controlled electrical measuring devices for thermoelectric generator of power plant [AD-727461] p0244 N71-38010
- MECHANICAL DEVICES**
- Mechanical electromagnet model of MHD dynamo achieving direct conversion of mechanical to magnetic field energy p0166 A70-28654
- Jet compression role in high temperature mechanical energy conversion heat exchanger based on ejector principle p0179 A72-27724
- Mechanical heat engines as energy conversion devices for space power generation p0228 N70-16221
- Development of solar energy powered heliotrope assembly to orient solar array toward sun [NASA-CASE-GSC-10945-1] p0065 N72-31637
- MECHANICAL DRIVES**
- Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft p0035 A71-27432
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-282] p0018 N72-13391
- MECHANICAL ENGINEERING**
- Petroleum mechanical engineering and pressure vessels and piping - ASME Conference, Denver, September 1970 p0262 A71-14767
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-282] p0018 N72-13391
- MECHANICAL PROPERTIES**
- Thermoelectric and mechanical performance of silicon-germanium solar thermoelectric generator [NASA-CR-72340] p0046 N68-12252
- MEDITERRANEAN SEA**
- Conference on use of solar energy in Mediterranean [BULL-22] p0069 N73-33762
- MEMBRANE STRUCTURES**
- Performance studies on a rechargeable hydrogen-oxygen fuel cell. p0186 A73-25988
- Performance of expandable whirling membrane solar energy concentrator [L-5484] p0049 N68-27926
- MERCURY (METAL)**
- Thermally regenerative energy conversion system using galvanic cells with electrochemically combined sodium and mercury streams to produce alloy and energy p0129 A68-27639
- MHD channel mercury flow with hydraulic shock in transverse magnetic field, determining characteristic values distribution over range of principal parameters p0149 A69-27499
- Thermodynamic analysis of supercritical mercury heat engine and magnetohydrodynamic generator [AE-355] p0224 N69-35785
- Analysis of ERTS-1 imagery of Northern Coast Ranges and Sacramento Valley, California for locating mercury deposits and oil and gas fields [PAPER-618] p0109 N73-28249
- MERCURY ARCS**
- Properties of mercury cesium plasma in crossed electrical and magnetic fields [SM-107/130] p0214 N69-15430
- MERCURY VAPOR**
- Mercury cesium plasma in crossed electric and magnetic fields as working fluid of MHD generators based on Rankine cycle p0143 A69-23450
- Thermodynamic parameters of MHD cycle employing supercritical Hg, indicating need for more suitable fluids p0156 A69-31914
- Magnetoplasma dynamic converters with mercury vapor and argon [DLR-PB-69-85] p0232 N70-26208
- METAL BONDING**
- Developments in vacuum diffusion welding methods and metallurgical applications of solar energy [NRL-M-22830-(5828,4F)] p0067 N73-20584
- METAL COATINGS**
- Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings [NASA-TT-F-11659] p0048 N68-22401
- Evaluation of solar mirror surface materials by ATS 3 reflectometer p0061 N71-25311
- METAL PARTICLES**
- Magnetohydrodynamic generator for mixing nonconductive gas and liquid metal mist to form slugs [NASA-CASE-XLE-02083] p0225 N69-39983

METAL POWDER

Reports on electric automobiles, plasma spraying, sintering, and vapor deposition thickness measurements

p0265 N69-34688

Nuclear grade uranium dioxide powder production technology in Australia
[CONF-690815-3]

p0090 N70-17649

METAL PROPELLANTS

Metallic uranium fueled pressurized water reactors for production of process heat or electric power
[ORNL-TM-2451]

p0232 N70-25646

METAL VAPORS

Liquid-metal MHD space power generation system using intermittent vaporization slugs shooting at 2700 R peak temperature

p0149 A69-27492

Liquid metal stream acceleration by same metal vapor for application in magnetohydrodynamic generator

p0192 N68-12691

Magnetohydrodynamic generator for mixing nonconductive gas and liquid metal mist to form slugs

p0225 N69-39983

[NASA-CASP-XLB-02083]

METAL-METAL BONDING

Investigation of the possibility of using radiant solar energy for welding and soldering of materials

p0040 A72-45126

METALLURGY

Contributions of NASA sponsored programs dealing with electroforming, Ni-Cd-Zn-Ag batteries, refractory alloys, fuel cells, solar cells, and stress corrosion in titanium alloys
[NASA-CR-96813]

p0011 N68-34388

METALS

A solar engine using the thermal expansion of metals.

p0046 A73-38473

Solar absorptances and spectral reflectances of metals

p0055 N69-31895

[NASA-TM-D-5353]

METEOROLOGICAL BALLOONS

Solar energy transmission measurements of plastic films used as solar cells for weather balloons

p0053 N69-16975

Role monitoring of drifting buoys and balloons in Southern Hemisphere for oceanographic and meteorological data

p0100 N72-25345

[NASA-TT-F-14279]

METHANE

Methane potentials as fuel for advanced aircraft, discussing performance, economy, combustion, heat transfer and handling

p0071 A68-33439

Liquid methane fuel substitution for kerosene in supersonic transport, discussing engine performance, aircraft design and cost reduction

p0072 A68-44446

Pollutants from methane fueled gas turbine combustion.

p0075 A73-15867

Tankage systems for methane-fueled supersonic transport

p0081 N68-23895

Experimental investigation of MHD generator

p0211 N69-13331

Composition and thermodynamic properties of combustion products of methane and air-oxygen

p0082 N69-13334

Electrical conductivity of methane combustion products with aerosols

p0222 N69-29923

Measurements of thermophysical properties of compressed fluid methane and survey of current literature on liquefied natural gas and methane

p0095 N71-22717

Calculation of mass flow rate of methane and natural gas through nozzles

p0104 N73-15309

Preliminary appraisal of hydrogen and methane fuel and fuel tank configuration in Mach 2.7 supersonic transport

p0020 N73-22711

[NASA-TM-X-68222]

METHODOLOGY

Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology

p0084 N69-30799

[SM-112/24]

Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets
[SM-112/25]

p0085 N69-30800

MICROANALYSIS

Gas chromatography and mass spectrometry applied to porphyrin microanalysis, studying homologous porphyrin series in ancient sediments and oils

p0073 A70-12516

MICROELECTRONICS

Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystem

p0173 A71-30801

MICROORGANISMS

Microorganism growth with petroleum fuels
[AD-680804]

p0083 N69-20205

MICROWAVE ANTENNAS

Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth

p0035 A71-28671

MICROWAVE EQUIPMENT

Fuel cells and microwave equipment of balloon electrical power systems
[AD-682898]

p0219 N69-25803

MICROWAVE FREQUENCIES

Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage

p0164 A70-21274

MICROWAVE OSCILLATORS

High efficiency and power long life cross field amplifier generator for solar energy conversion in space into microwave, discussing magnetron and amplatron

p0035 A71-28668

MICROWAVE TRANSMISSION

Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems

p0035 A71-28666

Pollution free electrical power generation from solar energy, discussing microwave transmission to earth, power shortages, thermal pollution and solar cell manufacture cost

p0036 A72-15892

[ASME PAPER 71-WA/SOL-2]

Synchronous satellite solar power station for solar energy conversion to microwaves for transmission to earth discussing technical, economic and social aspects

p0042 A73-15801

[ASME PAPER 72-WA/SOL-6]

Satellite solar power station for solar energy conversion and transmission to earth via microwave beam, discussing technology status and weight and cost projections

p0042 A73-18027

Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams

p0043 A73-22791

Satellite solar power station systems engineering study, examining basic concept technical and economic feasibility

p0043 A73-22814

Near-equatorial synchronous orbit Satellite Solar Power Station system with photovoltaic cell arrays energy conversion into microwave power for transmission to earth

p0043 A73-23601

Satellite electric power station for conversion of solar energy to microwaves beamed to earth, discussing structural design, flight control, transportation and technology assessment

p0044 A73-24554

Electric power generation on earth via satellite solar power station, assessing technologies of energy collection and conversion, microwave transmission and rectification

p0045 A73-35313

MICROWAVES

Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth

p0035 A71-28665

MILITARY AIR FACILITIES

SUBJECT INDEX

- Satellite solar power stations, considering energy conversion, microwave generators and beam transfer to earth p0036 A72-11770
- Dc or low frequency ac conversion of microwave power into electrical power [REPT.-4] p0205 N68-30681
- Microwave ionization for obtaining nonequilibrium plasma in MHD generators [NASA-TT-F-13783] p0242 N71-32212
- Dielectric and microwave properties of rocks and minerals p0097 N72-12262
- MILITARY AIR FACILITIES**
- Automatic controlled pressure system for onshore fueling of navy aircraft [AD-748211] p0267 N73-13997
- MILITARY AIRCRAFT**
- MHD power sources for onboard military aircraft electrical application p0167 A70-33474
- MILITARY TECHNOLOGY**
- Molten carbonate fuel cells power source for military applications, considering catalytic recycle reformer p0164 A70-20703
- MINERAL DEPOSITS**
- Correlation spectrometry from aircraft, balloons, and satellites applied to oil and mineral exploration and air pollution detection p0099 N72-23284
- ERTS-1 imagery of geosstructures of Alaskan continental crust and relation to mineral resources [E73-10321] p0105 N73-18353
- Mineral yearbook containing domestic industry data [PB-214329/5] p0108 N73-25411
- MINERAL EXPLORATION**
- Utilization of ERTS-1 imagery for mapping large scale structural lineaments in Precambrian Shield and basins containing younger sediments and for mineral and petroleum exploration [E73-10004] p0104 N73-15340
- Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [E73-10414] p0105 N73-26376
- Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [PAPER-G30] p0109 N73-28261
- Identification of geosstructures of continental crust in Alaska and relation to mineral resources and exploration [E73-11035] p0112 N73-31339
- MINERALOGY**
- Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics p0084 N69-30776
- Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum [E73-10700] p0108 N73-25392
- MINERALS**
- Seismic wave propagation used in prospecting for oil fields and minerals p0080 N68-17607
- Dielectric and microwave properties of rocks and minerals p0097 N72-12262
- Commercial utility of ERTS-1 imagery in structural reconnaissance of Precambrian Shield for minerals and petroleum [E73-10523] p0107 N73-23414
- MINES (EXCAVATIONS)**
- Radon daughter equilibrium measurements in uranium mine atmospheres p0088 N70-14317
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry [E72-10064] p0102 N72-32336
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E72-10193] p0102 N73-10372
- Bibliography on applications of nuclear explosions in mines, chemistry, and gas and oil extraction [CEA-BIB-129-ADD-1] p0104 N73-17719
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois [E73-10096] p0105 N73-18321
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois [E73-10371] p0105 N73-19366
- Feasibility of detecting subsurface coal fires in Wyoming and Montana from ground observation, aerial photography, and satellite imagery p0107 N73-22384
- Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana [E73-10776] p0108 N73-27252
- Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining [E73-10802] p0109 N73-27277
- Application of ERTS-1 imagery to study of fracture-related safety hazards in Indiana coal mining industry [E73-10970] p0111 N73-30311
- Application of ERTS-1 imagery to fracture-related mine safety hazards in Ohio coal mining industry [E73-11034] p0112 N73-31338
- Mapping of anthracite wastes from mining in Pennsylvania [E73-11107] p0112 N73-33264
- MINING**
- Reliability optimization of automatic coal mining equipment [NASA-TN-X-61123] p0081 N68-25716
- Transactions on Soviet mining thermophysics, and economics of extracting and using thermal energy sources p0089 N70-16584
- Cost analysis for geothermal boiler installation for mining thermal heat sources p0090 N70-16590
- Mineral yearbook containing domestic industry data [PB-214329/5] p0108 N73-25411
- MINORITY CARRIERS**
- Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency p0041 A73-14213
- MIRRORS**
- Absorber positioning inaccuracy influence in concentrating solar unit mirror on unit energy parameters, discussing defocusing p0030 A70-10763
- Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings [NASA-TT-P-11659] p0048 N68-22401
- Mirror systems in fuel cycles, loss reduction, and energy recovery [UCRL-71753] p0092 N70-28899
- Development of double mirror solar energy concentrator with nickel parabolic reflectors to increase maximum flux density [AD-741880] p0064 N72-29046
- MISSION PLANNING**
- Mission analysis for solar electric propelled spacecraft on Mars Orbiter, Jupiter flyby, and asteroid belt exploration trajectories [NASA-CR-106089] p0055 N69-38783
- MODELS**
- Model study of magnetohydrodynamic generator using argon-potassium plasma [AD-728591] p0246 N72-13698
- MODULATION**
- MHD power plant research and development, discussing shock wave electric power generators and modulated systems p0146 A69-24469
- MODULES**
- Primary isotope thermionic electric power module design, considering various assemblies p0155 A69-29190
- All metal thermionic nuclear module [CEA-CONF-1041] p0218 N69-24985

Flexible rolled-up solar array module thermal cycling tests
[NASA-TM-X-52995] p0061 N71-21206

MOLECULAR DIFFUSION
Niobium diffusion process for removing tritium from blanket of thermonuclear reactor
[ORNL-TM-2358] p0083 N69-19229

MOLECULAR EXCITATION
Vibrational excitation of nonequilibrium magnetohydrodynamic generator
[AD-740572] p0248 N72-29734

MOLTEN SALT ELECTROLYTES
Thermally regenerative Li-Sn cell with immobilized fused salt electrolyte, discussing current density-voltage curves for various operating conditions
p0137 A68-42517
Secondary cells with liquid lithium anodes and immobilized fused salt electrolytes
p0262 A69-15330
Molten carbonate fuel cells power source for military applications, considering catalytic recycle reformer
p0164 A70-20703
Summary of 30-years of research on molten carbonate fuel cells with both aqueous and nonaqueous electrolytes
[REPT.-67-C-210] p0201 N68-21439
Battery and fuel cell power sources for electric cars
[ECOM-2929] p0202 N68-23140
Molten carbonate fuel cell and molten electrolyte battery for electrically and thermally efficient power source with fast transient response
[AD-692538] p0226 N71-10447

MOLTEN SALT NUCLEAR REACTORS
Design parameters for molten salt breeder reactor
[WASH-1097] p0090 N70-19219

MOLYBDENUM
Thermionic emission characteristics of W and Mo subjected to focused CW carbon dioxide laser radiation, discussing direct energy conversion
p0162 A70-12068

MONTANA
Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376
Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[PAPER-630] p0109 N73-28261

MOTORS
Optical motor system to efficiently convert laser energy into mechanical rotational energy, giving equations for controlling motor speed
p0142 A69-22457

MOUNTAINS
ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California
[E73-10478] p0107 N73-21315

MULTIPHASE FLOW
Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities
[JPRS-46752] p0208 N69-11943

MULTISPECTRAL BAND SCANNERS
Application of ERTS-1 MSS imagery to multidisciplinary investigations in Alabama
[E73-10509] p0107 N73-22284

MULTISPECTRAL PHOTOGRAPHY
ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386

MULTISTAGE ROCKET VEHICLES
Numerical analysis of multistage liquid metal magnetohydrodynamic power conversion cycle
[NASA-CR-100500] p0217 N69-21376

N

NASA PROGRAMS

Lewis Research Center applications of optics to research in flight propulsion and space power generation, discussing gas density visualization, radiative heat transfer, etc
p0032 A70-23522

NASA-Lewis closed loop MHD low temperature power generator, describing systems performances during subsonic tests
p0165 A70-25614

NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects
[AIAA PAPER 71-825] p0174 A71-34720

NASA closed cycle MHD facility for power generation, discussing system components, design and operation
[AIAA PAPER 72-103] p0177 A72-16936

United States Space Nuclear Electric Power Program.
p0181 A72-45179

AEC/NASA thermionic reactor program with emphasis on technology utilization, comparing with French, German and Soviet programs
p0184 A73-22815

Contributions of NASA sponsored programs dealing with electroforming, Ni-Cd-Zn-Ag batteries, refractory alloys, fuel cells, solar cells, and stress corrosion in titanium alloys
[NASA-CR-96813] p0011 N68-34388

Conference summary - selected NASA technology in electric power industry utilization
p0012 N69-12586

Nuclear power for manned orbital space stations
[NASA-TM-X-52774] p0231 N70-25446

NATURAL GAS
Combustion products thermodynamic parameters for natural gas burning in oxygen atmosphere, plotting gas temperature and flow rates against pressure and excess oxidant ratio
p0075 A72-29451

Aircraft design for transporting arctic crude oil or liquid natural gas, examining air terminal requirements and handling specifications
p0077 A73-41172

Measurements of thermophysical properties of compressed fluid methane and survey of current literature on liquefied natural gas and methane
[NBS-9781] p0095 N71-22717

Natural gas and hydrogen-natural gas mixtures as automotive fuels and relationship of emissions to air-fuel ratio
[TPR-48] p0099 N72-18761

Research projects in energy sources, energy development, and exploitation
[ORNL-EIS-72-18-VOL-1] p0018 N72-25635

Calculation of mass flow rate of methane and natural gas through nozzles
[NASA-SP-3074] p0104 N73-15309

Combustion efficiency of annular turbojet combustor using heated natural gas as fuel
[NASA-TM-X-2742] p0105 N73-18960

NAVY
Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast
p0096 N71-35178

NETWORK ANALYSIS
Shadow effects on current-voltage characteristics of solar cell array circuits, developing mathematical models
p0028 A69-35709

NEUTRON ACTIVATION ANALYSIS
Trace element characterization in oil polluted water by neutron activation analysis
p0088 N70-15236

Contaminant determination in oil by neutron activation analysis
p0089 N70-15280

Using neutron activation analysis for quantitative measurement of trace elements in crude and residual fuel oils
[CA-9889] p0094 N71-15083

NEUTRON IRRADIATION
Nuclear seeded magnetohydrodynamic plasmas for electron kinetics using helium 3
[AD-690542] p0225 N69-39863

NEUTRON SOURCES

Utilization of neutron radiation from PuO₂ decay to provide spacecraft electric power
[NASA-CR-127045] p0101 N72-26528

NEW MEXICO

Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376

Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392

Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[PAPER-G30] p0109 N73-28261

NEW YORK

Geological mapping of New York State based on ERTS-A imagery
[E72-10320] p0101 N72-29272

NICKEL CADMIUM BATTERIES

Systems engineering for preliminary criteria on HEAO power supply system and components
p0057 N70-22921

Solar charger kit for nickel cadmium battery of integrated observation system
[AD-734809] p0063 N72-19066

NICKEL COMPOUNDS

High energy long shelf life lithium-nickel sulfide batteries performance tests
p0262 A71-13041

NIMBUS SATELLITES

Design and performance of photovoltaic power system on Nimbus 2 spacecraft
[NASA-CR-62045] p0202 N68-24455

Solar power conversion subsystems with load capability range from 200 to 500 W considered for advanced Nimbus missions
[NASA-CR-100529] p0053 N69-22175

NIMBUS 4 SATELLITE

Solar conversion power supply subsystem for Nimbus 4 satellite, and engineering tests
[NASA-CR-103418] p0055 N69-32305

Manufacturing and qualification testing of solar conversion power supply subsystem for Nimbus 4
[NASA-CR-10609] p0055 N69-38442

NIOBIUM

Niobium diffusion process for removing tritium from blanket of thermonuclear reactor
[ORNL-TN-2358] p0083 N69-19229

NIOBIUM ALLOYS

Superconducting magnet of niobium-titanium and copper composite for use in controlled thermonuclear fusion research
[UCRL-71010] p0218 N69-22640

Research and development of superconducting magnetic systems for MHD generators using Nb-Ti alloys
[AD-706779] p0237 N70-37715

NITRIDES

Uranium mononitride as nuclear reactor fuel for space vehicle power supply applications, discussing fabrication techniques and irradiation behavior
p0074 A72-22406

NITROGEN OXIDES

Nitrogen oxide turbojet emissions minimization with hydrogen compared to kerosene /JP/ fuels due to flammability limits, burning velocity and introduction in combustor as gas
p0116 A73-37498

NOISE (SOUND)

Senate subcommittee hearings on air and water pollution, including data on noise pollution and automobile fuel research
p0016 N70-41770

NOISE REDUCTION

Civil aircraft future propulsion requirements, considering larger engine sizes, higher takeoff thrusts and lower noise levels
[CASI PAPER 72/13] p0174 A71-37600

Noise reduction modifications in JT3D and JT8D gas turbine engine by single stage fan replacements
[SAE PAPER 730346] p0187 A73-34694

NONEQUILIBRIUM FLOW

Electric arcs in ionized and nonionized gas stream
[SM-74/238] p0213 N69-13347

Large scale nonequilibrium magnetohydrodynamic generator
[AD-693153] p0226 N70-11020

Optimization of linear nonequilibrium MHD generator
[AD-707803] p0237 N70-40031

NONEQUILIBRIUM IONIZATION

Buildup time for nonequilibrium argon ionization at inlet of MHD generator channel
p0122 A68-19914

Nonequilibrium modes of MHD converters, discussing electrically and magnetically induced nonequilibrium ionization, inhomogeneous flow, radical and ion recombination in combustion systems
[AGARDGRAPH 81] p0123 A68-22531

Closed cycle plasma MHD systems, discussing nonequilibrium ionization, reactor economics, performance and requirements
p0126 A68-22960

MHD generator mounted at shock tube downstream used to obtain magnetically induced ionization, considering minimum initial equilibrium electron density
p0126 A68-23120

Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization
p0131 A68-31228

Plasma MHD power generator, considering seeded gases electrical properties and nonequilibrium ionization in induced electric field, noting rocket driven MHD generators
p0132 A68-37062

High effective electrical conductivity and power densities in closed cycle MHD power generation, considering effect of local nonequilibrium ionization
p0133 A68-40538

Inert gas nonequilibrium MHD power generation in shock tube
p0140 A69-12425

Thermodynamic comparison of MHD generators using Brayton and Rankine cycles, showing Rankine cycle conversion at higher channel Mach numbers for nonequilibrium ionization
p0140 A69-14154

Ionization turbulence effect on nonequilibrium plasma MHD generator performance, using I-V characteristics equation
p0179 A72-29354

Nonequilibrium ionization in magnetohydrodynamic conversion generators
p0186 A73-28071

Nonequilibrium ionization in potassium gas magnetohydrodynamic generator
[AI-67-138] p0192 N68-11928

Nonequilibrium conductivity of plasma in MHD generator
[SM-74/104] p0210 N69-13324

Generation of MHD power with cesium seeded inert gas through use of nonequilibrium ionization
[NASA-TN-X-67975] p0246 N72-12166

NONEQUILIBRIUM PLASMAS

Hall voltage reduction in linear MHD generators noting Lorentz force effect
p0133 A68-39722

MHD power generator using nonequilibrium plasma generated by inductively coupled RF electric fields, noting plasma diagnostic techniques
p0133 A68-41161

Ar-K plasma studied as possible MHD generator working fluid by investigating influence of emission and external magnetic field on nonequilibrium electrical conductivity
p0143 A69-23441

Linear nonequilibrium MHD generator operating at Mach 2 and Hall parameter of 3 using cesium seeded helium as working fluid
p0144 A69-23471

MHD generator performance operating on nonequilibrium Ar plasma with K additions in presence of electric fields
p0145 A69-23480

Paraday type MHD energy converters in nonequilibrium conduction mode, analyzing two dimensional current and potential distributions in plane normal to magnetic field
p0146 A69-25397

- Critical Hall parameter indicating instability in alkali-seeded noble gases in nonequilibrium MHD generators
[AIAA PAPER 70-40] p0163 A70-18107
- Preionization in Cs seeded Ar nonequilibrium plasma for MHD generators, examining discharge characteristics, recombination reactions, etc
p0168 A70-39991
- Pulsed MHD generator model with nonequilibrium plasma, obtaining I-V characteristics
p0174 A71-35273
- Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakages and current distribution
p0179 A72-29353
- Ionization turbulence effect on nonequilibrium plasma MHD generator performance, using I-V characteristics equation
p0179 A72-29354
- Experimental investigation of the characteristics of a nonequilibrium MHD generator
p0190 A73-39618
- Efficiency of power production in MHD generators with nonequilibrium plasmas
[IAE-1701] p0235 N70-33216
- Microwave ionization for obtaining nonequilibrium plasma in MHD generators
[NASA-TT-F-13783] p0242 N71-32212
- Energy balance relationships used for evaluating maximum parameters of MHD generator operating on nonequilibrium plasma
[AD-726588] p0244 N71-37309
- Efficiency of electric power production on MHD generators in nonequilibrium plasma
[AD-724973] p0245 N72-10782
- NONLINEAR SYSTEMS**
- Nonlinear dynamic model of nuclear power plants with single-phase coolant reactors
[AE-341] p0217 N69-21373
- NONUNIFORM FLOW**
- Optimal load circuits number for maximum power extraction from Hall MHD generator with nonuniform gas flow along channel
p0170 A70-44900
- Effects of nonuniform gas flow on electrical performance of MHD generators
[AEC-TR-7102/3] p0245 N72-11610
- NORTH AMERICA**
- Satellite-aircraft approach to oil detection and rock identification in North and South America
[NASA-CR-101384] p0084 N69-28160
- NOZZLE DESIGN**
- Experimental results on two phase supersonic nozzle used in liquid metal magnetohydrodynamic generators
[NASA-CR-97877] p0209 N69-13287
- Pilot plant for demonstrating nozzle separation method for uranium enrichment
[NP-TR-1884] p0094 N70-39255
- Use of air-assist fuel nozzle to reduce exhaust emissions from gas turbine combustor at simulated idle conditions - J-57 engine
[NASA-TN-D-6404] p0096 N71-31456
- Effect of fuel zoning and fuel nozzle design on exhaust pollution emissions at ground idle conditions for double-annular ram-induction combustor for turbofan engines
[NASA-CR-121094] p0104 N73-17916
- NOZZLE FLOW**
- Research and advanced concepts - laminarization in nozzle flow, liquid metal magnetohydrodynamic power conversion, swirling and nonswirling gas flow, magnetic field effects in square channel
p0207 N68-37410
- Injector characteristics using wet steam in connection with magnetohydrodynamic generator applications
[NASA-CR-97878] p0209 N69-13286
- Calculation of mass flow rate of methane and natural gas through nozzles
[NASA-SP-3074] p0104 N73-15309
- NOZZLE GEOMETRY**
- Gas dynamics of supersonic radial nozzles for magnetohydrodynamic generators
[FTD-MT-24-208-67] p0206 N68-35663
- NUCLEAR AUXILIARY POWER UNITS**
- Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources
p0174 A71-34227
- Uranium mononitride as nuclear reactor fuel for space vehicle power supply applications, discussing fabrication techniques and irradiation behavior
p0074 A72-22406
- Development of a plutonium-fueled miniature power supply based on thermionic conversion.
p0186 A73-26028
- Solar cells, radioisotope generators, fission electric cells, and thermionic converters considered for Jupiter spacecraft mission
p0201 N68-21480
- Thermoelectric, thermionic, and Brayton conversion devices for radioisotopic power generators
[AD-687131] p0223 N69-32804
- Design, development, and performance of 35 to 150 kilowatt Brayton power conversion module and application to nuclear reactor powered system
[NASA-TN-D-6525] p0243 N71-35233
- NUCLEAR ELECTRIC POWER GENERATION**
- Nuclear energy systems, discussing U.S. reactor concepts with emphasis on thermionic systems and space applications
p0156 A69-29278
- Rankine cycle technology concerning high temperature, refractory alloy and liquid metal experience, showing applicability to nuclear Brayton and thermionic power systems
p0163 A70-12513
- Brayton, Hg, organic-Rankine and potassium-Rankine dynamic space power systems for use with nuclear energy sources
p0166 A70-29492
- Rankine cycle turboelectric nuclear space power conversion system with liquid K as working fluid, discussing current technology status
[GESP-623] p0174 A71-33525
- Laser beam power transmission to lunar bases or spacecraft from nuclear fueled satellite power station, discussing achievable ranges and efficiencies
p0257 A72-35328
- United States Space Nuclear Electric Power Program.
p0181 A72-45179
- Spacecraft nuclear power source optimization, considering radioisotope and reactor heat sources, cryogenic cooler cycle types and spacecraft design
p0184 A73-22799
- Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems
[SAN-679-3] p0191 N68-10967
- Peaceful application of nuclear energy
[TID-24102] p0010 N68-18384
- Reactivity effects caused by radial power flattening in gas cooled, fast-spectrum reactor
[NASA-TN-D-4459] p0080 N68-19925
- Thermoelectric converter for nuclear energy system
[BMW-FB-W-68-10] p0202 N68-24189
- General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power
[FTD-MT-64-355] p0203 N68-26786
- Conceptual design of 10 MWe nuclear Rankine system nuclear electric space power
[UCRL-50382] p0205 N68-30760
- Parametric design data on canned ac induction motors for space nuclear electric power systems
[SAN-679-5] p0205 N68-31544
- Parameter analysis of electric power distribution and conditioning systems of Rankine type space nuclear power plants
[WABD-67-45E] p0206 N68-32748
- SNAP 8 35 kW nuclear electric space power system
[NASA-TN-X-61161] p0264 N68-33238
- Technological level and production of atomic industry in U.S.S.R. and other nations
[NIC-TRANS-2653] p0011 N68-38243
- Fast-breeder reactors as heat sources for nuclear electric power generation based on NASA-DERIVED technology
p0012 N69-12576

- Space Rankine cycle power systems technology applied to ground-based power systems
p0208 N69-12577
- Rankine cycle system studies for nuclear space power
[UCRL-70863] p0218 N69-23173
- Space power systems lectures on sources and requirements
[ESRO-SP-451] p0226 N70-11301
- Nuclear reactors for electric power sources in space applications
p0226 N70-11305
- System analysis of lithium-cooled Rankine cycle nuclear-electric space power unit
[NASA-TM-X-1919] p0226 N70-11975
- Nuclear electric power systems for space use
p0228 N70-16220
- Performance characteristics of SNAP 8 and solar cell electrical generating systems for lunar bases
p0237 N70-39278
- Conceptual design of 5 kW radioisotope-fueled power system for terrestrial applications
p0238 N71-11062
- Literature survey of materials for gaseous thermionic conversion systems for use in space
[NASA-TM-X-2130] p0238 N71-11689
- Deep sea radioisotope-fueled thermoelectric generator power supply system
[MMM-3691-62] p0239 N71-15039
- Application of solar, nuclear, and chemical power systems for spacecraft power supplies
p0260 N71-19649
- Application of nuclear energy to meeting needs of increasing populations and reduction in environmental pollution through use of nuclear energy
[INFCIRC/139/ADD-1] p0617 N71-33879
- Pulsed ionization chamber for plasma diagnostics, and applications to MHD electrical power generation from gas cooled reactors
[AD-747681] p0250 N73-12800
- NUCLEAR ENERGY**
- Nuclear energy value to society, stressing usefulness for electric power generation and marine propulsion
p0177 A72-14376
- Heat transfer research review, discussing gas turbines, aeronautics, astronautics, nuclear power, thermal pollution and controlled fusion challenges
p0178 A72-23684
- Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum.
p0188 A73-38386
- Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology atomic energy industry
[TID-24190] p0012 N69-17184
- Undersea warfare energy systems of extended endurance
[AD-681068] p0217 N69-20548
- Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics
p0084 N69-30776
- Projected future world energy requirements, resources, and need for breeder and fusion reactors
[REPT-69-11] p0013 N69-35574
- Cost estimates for nuclear energy and heat use in various industrial plant processes
p0013 N70-14504
- Economic utilization of nuclear power plants in chemical and industrial centers
p0014 N70-14506
- Low cost nuclear power for acetylene manufacture
p0117 N70-14509
- Low cost nuclear energy for production of electrolytic ammonia
p0117 N70-14512
- Nuclear power plant energy for heating urban center
p0227 N70-14518
- Application of nuclear energy to meeting needs of increasing populations and reduction in environmental pollution through use of nuclear energy
[INFCIRC/139/ADD-1] p0017 N71-33879
- Analysis of potential applications of nuclear energy and prediction of impact on technical societies
[NASA-TM-X-67963] p0017 N72-11844
- NUCLEAR ENGINE FOR ROCKET VEHICLES**
- NERVA reactor technology applied to closed Brayton cycle MHD power system
[AIAA PAPER 70-1225] p0170 A70-45956
- NUCLEAR EXPLOSIONS**
- Potential applications of nuclear explosives to recover geothermal energy
[USGS-289-1] p0088 N70-12921
- Bibliography on applications of nuclear explosions in mines, chemistry, and gas and oil extraction
[CEA-BIB-129-ADD-1] p0104 N73-17719
- NUCLEAR FUEL ELEMENTS**
- Thermionic fuel elements for in-core reactor power plant space applications, summarizing operating and environmental requirements and technology development
p0076 A73-22819
- Development of a plutonium-fueled miniature power supply based on thermionic conversion.
p0186 A73-26028
- Thermoelectric nuclear batteries fabrication in milliwatt power range combining bismuth telluride thermopiles with plutonia fuel capsules
p0188 A73-38410
- Cost estimates for preparation and fabrication of solid-gel metal-clad uranium and plutonium oxide fuel elements
[ORNL-TM-1979] p0078 N68-12553
- Fuel cost program for use of plutonium in thermal reactors
[EUR-3890.1] p0081 N68-23663
- Phoenix nuclear fuel cycle costs evaluated for use in maritime reactor design
[BNWL-851] p0082 N69-15543
- Costs and flow charts for thorium and uranium recovery from HTGR fuel elements containing silicon carbide coated fissile and fertile particles
[GAND-8661] p0083 N69-17117
- Nonaqueous fuel processing based uranium alloys and breeder reactor fuels
[ANL-TRANS-704] p0084 N69-25563
- Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-0243.F] p0085 N69-31119
- Cost analyses for thermal-hydraulic, physics, and fuel-cycle economics of pressurized water reactors using annular metal pins as fuel
[ORNL-TM-2493] p0088 N70-12423
- Uranium/thorium cycle in reprocessing and refabrication of irradiated fuel elements for power reactors
[NLL-RISLEY-TRANS-1783-/9091.9P] p0091 N70-20121
- NUCLEAR FUELS**
- Thermionic generator space power system using solar energy thermionic /SET/ diode array and incandescent radioisotope fuel block radiant heat source
p0128 A68-24403
- Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma
p0176 A71-38949
- Uranium mononitride as nuclear reactor fuel for space vehicle power supply applications, discussing fabrication techniques and irradiation behavior
p0074 A72-22406
- State of development of an actinium fueled thermionic generator.
p0075 A72-36169
- The impact of aerospace technology on energy conversion in the 70's.
[ASME PAPER 72-AERO-11] p0008 A72-43147
- The availability and cost of curium-244 from power reactor fuel reprocessing wastes.
p0077 A73-38430
- Uranium carbide preparation from uranium tetrafluoride, ammonium diuranate, and uranium trioxide studied to optimize production
[AI-CE-73] p0078 N68-11281
- Deep sea radioisotope fueled thermoelectric generator power supply system design
[MMM-3691-20] p0191 N68-11382

SUBJECT INDEX

NUCLEAR POWER PLANTS

Equilibrium fuel cycle costs for low-enriched, unclad, helium cooled, uranium oxide graphite reactor
[ORNL-TM-1789] p0078 N68-12420

Titration method for uranium concentration analysis in solutions of irradiated fuel reprocessing plants
[CNEA-192] p0079 N68-17192

Nuclear fuel requirements and costs of reactors in Germany /supplement/
[KFK-466] p0081 N68-22608

Fuel cycle costs for varying designs of gas cooled fast breeder reactors
[GA-8032] p0081 N68-29161

Research on sol-gel stimulated by results on thorium and interest in fast reactor fuels
[RT/CHI/68/28] p0082 N69-11048

Hybrid fossil nuclear fueled MHD power cycle characteristics
[BNL-12569] p0082 N69-11230

Solid solution oxide fuels for space electric power heat systems
[LA-DC-9686] p0264 N69-14302

Results from USARC plutonium utilization programs conducted by Battelle-Northwest
[BNWL-SA-2065] p0082 N69-15237

Fuel cycle cost comparisons for low enriched uranium
[ORNL-TM-2173] p0083 N69-17558

Coated particle fuels for preventing undesirable reactions in nuclear reactors
[ORNL-4324] p0083 N69-19605

Fuel treatment by selective volatilization of uranium and plutonium fluorides
[CEA-CONF-1195] p0083 N69-25510

Economics and handling nuclear fuel systems for power reactors
[CEA-CONF-1093] p0257 N69-27096

Cost of thorium fuel cycles for heavy water and graphite moderated reactors
[EUR-4264.E] p0085 N69-31081

Uranium fueled fast steam cooled reactors in SNEAK series
[EUFNR-608] p0085 N69-31161

Background information on uranium enrichment for nuclear fuel including costs, operations, and equipment
[ORO-668] p0086 N69-31272

Fast breeder reactor design considerations of blanket cycle efficiency and management
[CEA-CONF-1093] p0086 N69-31987

Economic fabrication of nuclear fuel-uranium monocarbide for reactors
[EUR-4273.D] p0086 N69-38967

Safety criteria for nuclear fuel transport
[CEA-CONF-1093] p0257 N69-37570

Critical fuel loading, core hot-spot power generation, and detailed fission rate measurement of critical or subcritical reactors
[CONF-690815-3] p0088 N70-14123

Natural resource and industrial programs for nuclear fuel research
[NASA-CN-107560] p0089 N70-15491

Nuclear grade uranium dioxide powder production technology in Australia
[CONF-690815-3] p0090 N70-17649

Experimental studies in nuclear chemistry and thermochemistry for improved reactor fuels
[ANL-7575] p0090 N70-19586

Continuous testing of environment at Marcoule chemical plant for irradiated fuel treatment
[NLL-HISLEY-TRANS-1866-/9091.9F] p0091 N70-20596

Radioactive dust in air at KUR operation from fission production of fuels and activated aerosols
[KURRI-TR-56] p0091 N70-21010

Fuel depletion and sodium void coefficients, and economic evaluation of sodium cooled fast nuclear reactor
[CONF-690815-3] p0230 N70-22218

Rod heater with indirect resistance heating for simulation of nuclear fuel rods
[KFK-894] p0230 N70-22247

EQUICORE - space dependent code written in FORTRAN 4 assessing nuclear and thermal performance in reactors
[TRG-1808] p0230 N70-22307

Mirror systems in fuel cycles, loss reduction, and energy recovery
[OCRL-71753] p0092 N70-28899

Japanese nuclear fuels and reactor materials technology
[LIB/TRANS-240] p0093 N70-33032

High temperature reactor design
[TRG-1996] p0093 N70-37284

Cost analysis for reprocessing of irradiated plutonium and uranium mixed oxides
[CEA-CONF-1534] p0093 N70-39139

Deep sea radioisotope-fueled thermoelectric generator power supply system
[MMN-3691-62] p0239 N71-15039

Examining fuel cycle codes using different techniques for fuel cost calculations
[BNWL-SA-3605] p0094 N71-21050

Development of minimum and optimum requirements for environmental surveillance programs around nuclear fuel reprocessing plants
[CONF-720519-1] p0095 N71-29878

Development of PuO₂-Mo fuel disks for electric space power
[LA-4697] p0097 N72-12617

Production, purification, and conditioning of Ac-227 and development of isotopic heat source fueled with Ac-203
[A/CONF-49/P/287] p0098 N72-16196

ROB, nuclear and fuel-cycle analysis code, for circulating fuel reactors and optimizing core design
[ORNL-TM-3359] p0098 N72-17737

Gaseous nuclear fuel for gas reactors and magnetohydrodynamic plants
[JPRS-55126] p0247 N72-17956

Development of isotopic power fuels for use at temperatures up to 2000 C
[ORNL-4750] p0100 N72-24703

Research projects in energy sources, energy development, and exploitation
[ORNL-EIS-72-18-VOL-1] p0018 N72-25635

Use of Cm-244 as radioisotope power fuel in electric power conversion systems
[CONF-720519-1] p0103 N73-12717

NUCLEAR FUSION

Nuclear fusion reactor development, discussing magnetic field confinement of hot dense plasmas and electric power production economic possibilities
[CONF-720519-1] p0142 A69-20124

Book on direct energy conversion principles and methods covering fusion, fuel cells, MHD, thermoelectric, thermionic, photovoltaic, electrohydrodynamic, piezoelectric and ferroelectric power generation
[CONF-720519-1] p0171 A71-11193

Large-scale applications of superconducting coils, including nuclear fusion and fission
[LA-DC-9519] p0183 A73-20107

Available energy sources and sources of future including nuclear fusion and fission
[LA-DC-9519] p0010 N68-28181

Feasibility of power by nuclear fusion
[ORNL-TM-2204] p0204 N68-30162

Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings
[MATT-659] p0218 N69-23954

Controlled thermonuclear fusion for space power and propulsion
[MATT-659] p0229 N70-18729

Direct conversion of fusion power to electricity and reduction of waste heat in reactors
[TID-25414] p0237 N70-39141

Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736

Method for technical evaluation of controlled nuclear fusion for energy production
[NP-19152] p0019 N73-12707

NUCLEAR INTERACTIONS

Power production based on controlled fusion of deuterium and tritium nuclei, noting use of magnetic bottle for plasma confinement
[CONF-720519-1] p0131 A68-32685

NUCLEAR POWER PLANTS

STAR /Stud and Rocker Panel/ four couple section improved by incorporating bonded tungsten electrical contacts for PbTe thermoelectric elements
[CONF-720519-1] p0162 A69-42261

Social quantitative benefit vs risk assessment of new technologies, considering atomic power safety
[CONF-720519-1] p0007 A71-12120

NUCLEAR POWER REACTORS

SUBJECT INDEX

- Power plants, cost estimates, freighter missions, commercial feasibility and technology for nuclear air cushion vehicles
pC187 A73-32194
- Thermal mapping at electrical power generating sites for outfall from fossil or nuclear fuel plants, considering airborne application
pC076 A73-33360
- Exploratory study of several advanced nuclear-MHD power plant systems.
pC189 A73-38411
- The Satellite Nuclear Power Station - An option for future power generation.
pC189 A73-38412
- Comparison of load-bearing conical nonload-bearing panel heat radiators for potassium Rankine nuclear power plant
[NASA-CN-72307] p0190 N68-10050
- Nuclear research and power plant developments in various countries, and operating experience with fast reactors and breeder reactors
[JPRS-43265] p0010 N68-10725
- Ultrasonic instrumentation for incipient boiling detection in liquid metals or fused salts
[NYO-3622-10] p0190 N68-10758
- Design and operational test data on SNAP, and nuclear reactor, conversion equipment, and spacecraft power systems technology
p0192 N68-12191
- Nuclear source limitations for direct conversion systems
p0196 N68-17803
- Environmental radiation and concentration levels of atomic gaseous diffusion plant
[GAT-553] p0010 N68-25106
- Analysis of trend in free world atomic power generation, uranium production, resources, and requirements until 1985
[ORNL-TR-1825] p0081 N68-28954
- Analytical data for electric power system components in advanced high temperature potassium Rankine nuclear space power systems
[CONF-680802-1] p0206 N68-34481
- Relative dose factors from long period point source emissions of atmospheric pollutants
p0011 N68-38380
- Economic analysis of balanced energy conversion and storage systems with application to conventional and nuclear power plants
p0264 N69-15054
- Nonlinear dynamic model of nuclear power plants with single-phase coolant reactors
[AE-341] p0217 N69-21373
- Fuel cells and microwave equipment of balloon electrical power systems
[AD-682898] p0219 N69-25803
- Nuclear power plants based on nuclear aircraft technology to power ocean-going air cushion vehicles
[NASA-TM-X-1871] p0013 N69-35723
- Cost analysis and engineering processes for civilian nuclear power production
p0087 N69-37567
- Optimal shielding criteria for nuclear apparatus onboard spacecraft
pC224 N69-38756
- Heat transfer from radioisotope capsules buried in porous materials
[AD-691213] pC225 N69-40031
- Cost estimates for nuclear energy and heat use in various industrial plant processes
p0013 N70-14504
- Nuclear power plants for low cost heat and electricity generation
p0014 N70-14505
- Economic utilization of nuclear power plants in chemical and industrial centers
p0014 N70-14506
- Systems model used to determine dynamic behavior of nuclear closed cycle, gas turbine plant with high temperature reactor
[NLL-WH-TRANS-271-/9091.9F/1] p0230 N70-21100
- Nuclear power for manned orbital space stations
[NASA-TM-X-52774] p0231 N70-25446
- Failure data handbook for liquid metal cooled nuclear power plants
[LMEC-MEMO-69-7-VOL-1] p0234 N70-31239
- Failure data handbook for nuclear power facilities - failure category identification and glossary
[LMEC-MEMO-69-7-VOL-2] p0234 N70-31812
- Japanese nuclear fuels and reactor materials technology
[LIB/TRANS-240] p0093 N70-33032
- Hazard evaluation for deuterium tritium fusion reactor power plant
[ORNL-TM-2822] p0015 N70-37097
- Air pollution of fossil and nuclear power plants
[CONF-700810-20] p0016 N71-13756
- Transfer functions for primary loop of conceptual nuclear Brayton space power plant
[NASA-TM-X-2193] p0240 N71-17933
- Steady state and transient operating characteristics of lithium cooled primary flow loop of nuclear Brayton space power plant
[NASA-TM-X-2161] p0240 N71-18866
- Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants
[JPRS-53174] p0016 N71-26623
- Design and component analysis of future magnetohydrodynamic nuclear power plants
[JUL-689-TP] p0242 N71-30458
- Gaseous fission, closed loop, MHD generator in nuclear electric power plant
p0243 N71-33632
- Proceedings of conference on licensing and control of nuclear power plants
[IAEA-SM-146/5] p0017 N71-35176
- Analysis of potential applications of nuclear energy and prediction of impact on technical societies
[NASA-TM-X-67963] p0017 N72-11844
- Proceedings of conference on magnetohydrodynamic electrical power generation
[AD-730450] p0247 N72-15235
- Uranium market affecting prices and nuclear power plant use
[NP-19C69] p0099 N72-20603
- Feasibility of mobile nuclear reactor power plants for cargo transportation and development of remote regions on earth
[NASA-TM-X-68164] p0020 N73-15693
- Three thermodynamic cycles of advanced nuclear MHD power plant systems
p0253 N73-28657
- ## NUCLEAR POWER REACTORS
- Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control
[AIAA PAPER 68-122] p0120 A68-17540
- Alkali metal Rankine turbogenerator program for space power supplies, discussing power plant design, nuclear reactor, radiator materials, etc
p0139 A68-45718
- Nuclear fusion reactor development, discussing magnetic field confinement of hot dense plasmas and electric power production economic possibilities
p0142 A69-20124
- Nuclear power supply with in-core thermionic reactor for space power source and use in satellite TV, discussing theory, design and components
p0142 A69-20871
- The availability and cost of curium-244 from power reactor fuel reprocessing wastes.
p0077 A73-38430
- Reactor shielding, reactor fuel temperatures, and radioisotope sources for dynamic energy conversion systems
p0195 N68-17794
- Fuel cost program for use of plutonium in thermal reactors
[EDF-3890.1] p0081 N68-23663
- Isotopic energy sources for space applications
p0226 N70-11304
- Uranium/thorium cycle in reprocessing and refabrication of irradiated fuel elements for power reactors
[NLL-RISLEY-TRANS-1783-/9091.9F] p0091 N70-20121
- ## NUCLEAR POWERED SHIPS
- Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions
[AIAA PAPER 70-1221] p0008 A71-22779

Phoenix nuclear fuel cycle costs evaluated for use in maritime reactor design
[BNWL-8511] p0082 N69-15543

NUCLEAR PROPELLED AIRCRAFT
Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions
[AIAA PAPER 70-12211] p0008 A71-22779

Nuclear power plants based on nuclear aircraft technology to power ocean-going air cushion vehicles
[NASA-TM-X-18711] p0013 N69-35723

NUCLEAR PROPULSION
Analysis of potential applications of nuclear energy and prediction of impact on technical societies
[NASA-TM-X-679631] p0017 N72-11844

NUCLEAR RADIATION
Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets
[SM-112/25] p0085 N69-30800

NUCLEAR REACTIONS
Experimental studies in nuclear chemistry and thermochemistry for improved reactor fuels
[ANL-7575] p0090 N70-19586

Fossil fuel and nuclear fission resources for energy
[A/CONF-49/P/359] p0098 N72-16981

NUCLEAR REACTORS
Nuclear energy systems, discussing U.S. reactor concepts with emphasis on thermionic systems and space applications
p0156 A69-29278

Fusion energy technology, discussing controlled reactor construction and operation
p0171 A71-20000

Power supply and converters for satellite and spacecraft, discussing fuel cells, radioisotopes, nuclear reactors, etc
p0177 A72-16745

Thermoelectric radioisotope generators and nuclear thermoelectronic reactors, noting anaerobic self contained reliable operation and suitability for underwater energy sources
p0183 A73-22203

Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411

Plasma core reactor and inductive magnetohydrodynamic converter for power generating system
[DLR-FB-67-59] p0191 N68-11139

Design and operational test data on SNAP, and nuclear reactor, conversion equipment, and spacecraft power systems technology
p0192 N68-12191

Equilibrium fuel cycle costs for low-enriched, unclad, helium cooled, uranium oxide graphite reactor
[ORNL-TM-1789] p0078 N68-12420

Conceptual design of 10 MWe nuclear Rankine system nuclear electric space power
[UCRL-50382] p0205 N68-30760

High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters
[NASA-TT-P-11825] p0205 N68-30811

Coated particle fuels for preventing undesirable reactions in nuclear reactors
[ORNL-4324] p0083 N69-19605

Cost of thorium fuel cycles for heavy water and graphite moderated reactors
[EUR-4264.E] p0085 N69-31081

Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-4243.F] p0085 N69-31119

Economic fabrication of nuclear fuel-uranium monocarbide for reactors
[EUR-4273.D] p0086 N69-34967

Projected future world energy requirements, resources, and need for breeder and fusion reactors
[REPT-69-11] p0013 N69-35574

Subassembly test program in Spert 4 capsule driver core for FY 1969 and 1970
[IN-1313] p0088 N70-13396

Pulsed thermonuclear reactor operated with lasers
[AEC-TR-7148] p0237 N70-38825

Direct conversion of fusion power to electricity and reduction of waste heat in reactors
[TID-25414] p0237 N70-39141

Steady state and transient operating characteristics of lithium cooled primary flow loop of nuclear Brayton space power plant
[NASA-TM-X-2161] p0240 N71-18866

Design, development, and performance of 35 to 150 kilowatt Brayton power conversion module and application to nuclear reactor powered system
[NASA-TM-D-6525] p0243 N71-35233

Development of combined turbine-magnetohydrodynamic generator operating in Brayton cycle with NERVA nuclear reactor for space and ground applications
[NASA-TM-D-6513] p0244 N71-36450

Cost analysis and design of possible fusion reactor coil systems
[UCRL-73187] p0019 N73-12741

NUCLEAR RESEARCH
Nuclear research and power plant developments in various countries, and operating experience with fast reactors and breeder reactors
[JPRS-43265] p0010 N68-10725

Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology
[SN-112/24] p0084 N69-36799

NUCLEAR RESEARCH AND TEST REACTORS
Operation, research, and maintenance of gas coolant loops of Pegase nuclear fuel testing reactor
[CEA-R-3564] p0221 N69-27494

NUCLEAR ROCKET ENGINES
Nuclear energy systems, discussing U.S. reactor concepts with emphasis on thermionic systems and space applications
p0156 A69-29278

Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma
p0176 A71-38949

Uranium plasmas applied to nuclear rocket engines, MHD generators, nuclear lasers, and plasma stability and flow - conference
[NASA-SP-236] p0242 N71-33626

NUCLEATE BOILING
Ultrasonic instrumentation for incipient boiling detection in liquid metals or fused salts
[NYO-3622-10] p0190 N68-10758

NUCLEATION
Performance of helium seeded with uranium in magnetohydrodynamic generator
p0243 N71-33663

NUMERICAL ANALYSIS
Numerical analysis method for performance prediction of linear induction machines including liquid metal MHD pumps and generators and linear motors
p0179 A72-29365

Numerical calculation methods for various plasma physics and controlled fusion problems
[UCRL-71205] p0207 N68-35919

Numerical analysis of multistage liquid metal magnetohydrodynamic power conversion cycle
[NASA-CR-100500] p0217 N69-21376

Methane or hydrogen fuel direct cooling of first stage stator of SST aircraft turbine - numerical heat transfer analysis
[NASA-TM-D-6042] p0117 N70-42326

OCEAN BOTTOM
Geophysical survey of continental shelves off African coast and mapping for oil potential
[PB-211393] p0103 N73-14400

OCEAN CURRENTS
Degradation, dispersion and movement of oil slicks by wind and ocean as factors influencing applicability of countermeasures
[WMO-359] p0112 N73-32300

OCEAN SURFACE
Detection and monitoring of oil slicks on sea surface using four frequency radar system
p0097 N72-12311

OCEANOGRAPHY

Bale monitoring of drifting buoys and balloons in Southern Hemisphere for oceanographic and meteorological data
[NASA-TT-P-14279] p0100 N72-25345

OCEANS

Nuclear power plants based on nuclear aircraft technology to power ocean-going air cushion vehicles
[NASA-TM-X-1871] p0013 N69-35723

OFF-ON CONTROL

A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.

p0186 A73-25984

OHIO

Ecological effects of strip mining in Ohio based on interpretation of ERTS-1 imagery
[E72-10069] p0101 N72-31353

Mapping ecological effects of coal strip mining in Ohio
[E72-10256] p0102 N73-12356

Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio
[E72-10259] p0102 N73-12358

Detection and monitoring area strip mining and reclamation in Ohio using ERTS-1 imagery
[E72-10284] p0103 N73-13334

Environmental and ecological effects of coal strip mining in Ohio
[E73-10003] p0019 N73-15339

Resources management in Ohio utilizing ERTS-1 imagery
[E73-10032] p0104 N73-15365

Ecological effects of coal strip mining in Ohio
[E73-10430] p0106 N73-20391

Physical interpretation of geology, hydrology, and glaciology revealed by ERTS-1 imagery of east central Ohio
[E73-10454] p0106 N73-20413

Detection, monitoring, and mapping coal strip mining and reclamation in Ohio from ERTS-1 imagery
[E73-10641] p0107 N73-25338

EREP imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337

Application of ERTS-1 imagery to determine ecological effects of strip mining in eastern Ohio
[PAPER-E2] p0109 N73-28266

Application of ERTS-1 imagery to resource management in Ohio
[PAPER-R3] p0110 N73-28361

Mapping of strip mine areas in southeastern Ohio from ERTS-1 imagery
p0110 N73-28372

Application of ERTS-1 imagery to resources management and planning in Ohio
[E73-10987] p0112 N73-31294

SKYLAB monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337

Application of ERTS-1 imagery to fracture-related mine safety hazards in Ohio coal mining industry
[E73-11034] p0112 N73-31338

OHMIC DISSIPATION

Performance characteristics of single wavelength liquid metal MHD induction generator with end loss compensation, determining electrical losses and power production
p0122 A68-19849

MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0131 A68-31226

MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0140 A69-14152

Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance
p0144 A69-23463

Integral characteristics of MHD generator with diverging electrodes
[AD-694396] p0227 N70-13251
MHD energy conversion using Joule heating
[AD-720257] p0241 N71-26190

OIL ADDITIVES

Soviet Bloc research on petroleum refining and additive properties
[AD-700689] p0093 N70-35477

OIL EXPLORATION

Heat losses in oil wells hot liquid injections, modifying Orloveanu approximation method for exact solution
p0074 A72-15743

17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734

Rotary wing aircraft ecological advantages in logging, off shore oil exploration and short haul passenger transport for airport size reduction
p0076 A73-33185

Correlation spectrometry from aircraft, balloons, and satellites applied to oil and mineral exploration and air pollution detection
p0099 N72-23284

Applicability of NASA contract quality management and failure mode effect analysis procedures to USGS Outer Continental Shelf oil and gas lease management program
[NASA-TM-X-2567] p0100 N72-25955

Set of variables crucial to economic outcome of petroleum exploration
[NASA-CR-129595] p0103 N73-13991

Two stochastic models for petroleum exploration
[NASA-CR-129611] p0103 N73-13992

Suitability of ERTS-1 imagery for oil exploration in Oklahoma
[E72-10327] p0103 N73-14315

Utilization of ERTS-1 imagery for mapping large scale structural lineaments in Precambrian Shield and basins containing younger sediments and for mineral and petroleum exploration
[E73-10004] p0104 N73-15340

Oil exploration in Oklahoma using ERTS-1 MSS imagery
[E73-10322] p0105 N73-18354

Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376

Suitability of ERTS-1 imagery for oil exploration
[E73-10444] p0106 N73-20404

Oil exploration in large intercratonic sedimentary basins in Oklahoma using ERTS-1 imagery
[E73-10646] p0108 N73-25342

Oil exploration using ERTS-1 imagery of lithology and geological structures
[E73-11053] p0112 N73-32229

OIL SLICKS

Oil spread over Arctic ice, considering spread rate and oil slick size attainment for pollution potential during spills on tundra or pack ice
[AIAA PAPER 73-701] p0076 A73-36250

Pollution hazards from petroleum industries and shipping in Delaware Bay
p0104 N73-16948

Degradation, dispersion and movement of oil slicks by wind and ocean as factors influencing applicability of countermeasures
[WHO-359] p0112 N73-32300

OILS

Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast
p0096 N71-35178

Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1
[EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367

Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2
[EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368

OKLAHOMA

Suitability of ERTS-1 imagery for oil exploration in Oklahoma
[E72-10327] p0103 N73-14315

Oil exploration in Oklahoma using ERTS-1 MSS imagery
[E73-10322] p0105 N73-18354

- Oil exploration in large intercratonic sedimentary basins in Oklahoma using EPTS-1 imagery
[E73-10646] p0108 N73-25342
- ONBOARD EQUIPMENT**
Solar cells for onboard spacecraft energy supply, discussing design, operation and power output of various cells
p0024 A68-33039
- ONE DIMENSIONAL FLOW**
One dimensional plasma flow variables relations analyzed in crossed electric and magnetic fields with small magnetic Reynolds numbers
p0126 A68-23796
Optimum operation modes of MHD converter
p0142 A69-23095
One dimensional calculations on finite length magnetohydrodynamic induction generator
[UCRL-70795] p0205 N68-31910
- OPERATING TEMPERATURE**
Solar cell array fabrication methods extending operating temperature by pulsed spot welding techniques and deletion of adhesives
p0031 A70-12080
Linear solar collector conversion efficiency over wide operating temperature range via model consisting of long pipe with energy injection at points along length
[ASME PAPER 72-WA/SOL-71] p0042 A73-15802
- OPTICAL EQUIPMENT**
Optical motor system to efficiently convert laser energy into mechanical rotational energy, giving equations for controlling motor speed
p0142 A69-22457
Lewis Research Center applications of optics to research in flight propulsion and space power generation, discussing gas density visualization, radiative heat transfer, etc
p0032 A70-23522
- OPTICAL FILTERS**
Lens assembly for solar furnace or solar simulator
[NASA-CASE-XNP-04111] p0060 N71-15622
- OPTICAL PROPERTIES**
Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0023 A68-18449
Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0025 A68-39356
Solar installations optical properties selectivity increase by light-collecting surfaces mechanical treatment, describing plate grinding with abrasive powders
p0031 A70-19625
Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties
p0037 A72-24315
Solar cell optical properties effects on electrical and thermal performance and cost savings in panel design optimization
p0041 A73-14226
Electrical, thermal, and optical properties of semiconductor associated with energy conversion
[AD-693235] p0056 N70-11427
- OPTICAL REFLECTION**
Evaluation of solar mirror surface materials by ATS 3 reflectometer
p0061 N71-25311
- OPTICAL SCANNERS**
Design of multispectral scanner for orbital earth resources detection
[NASA-CR-102111] p0089 N70-16407
- OPTIMAL CONTROL**
Two stage gas turbine engine optimal tuning for RPM, thrust, fuel rate and gas temperature, describing automated bench tests
p0170 A70-43361
Minimal energy stochastic controller design for electrically driven vehicles, using dynamic programming
p0177 A72-17394
Modern control techniques applied to energy conservation flight control systems.
p0263 A73-38415
Computerized simulation of optimal automatic control of coal treatment plant
[AD-682791] p0084 N69-26099
- OPTIMIZATION**
Optimal dimensions for high temperature cylindrical cavity solar energy receivers by studying concentrator and receiver operation
p0023 A68-12549
MHD channel flow approximation calculation for determining optimal MHD power generation conditions
p0122 A68-18450
One wave induction MHD converter performance advantages over uncompensated multiwave converter balanced by friction losses and inductive power requirements
p0128 A68-23932
Optimization of linear conduction MHD generator with constant cross sectional area channel
p0130 A68-30712
Open cycle MHD generators optimization, predicting thermodynamic properties, electrical loading, etc
p0133 A68-39724
Thermoelectric power generators energy output efficiency, discussing thermal and electric contact resistances influence for optimizing parameters
p0147 A69-26364
High temperature solar energy converter cavity absorbers geometry, considering absorption parameters of radiation reflected by concentrator
p0030 A70-10761
MHD generators optimum load selection by method of stepwise approach, noting agreement with pressure and density distributions to yield maximum power
p0164 A70-24156
Optimal MHD generator with constant channel area, assuming small Reynolds numbers and ideal inviscid gas with arbitrary electrical conductivity
p0164 A70-24570
Hydrazine-oxygen fuel cells energy costs minimization by optimizing diaphragm thickness, hydrazine concentration and load
p0171 A71-14321
Optimal inlet parameters of MHD generator channel employing kerosene-gaseous oxygen combustion products
p0172 A71-22136
Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output
p0172 A71-23441
Quasi-vacuum mode thermionic converter for space and remote terrestrial power supplies, describing computer codes for design optimization
p0172 A71-25899
Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems
p0035 A71-28666
Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology
p0036 A71-31671
Optimized 100 We multicell thermionic power supply design with high reliability, noting isomeric converter performance characteristics
p0180 A72-34583
Optimal, elliptic and circular windings for superconducting nonferrous magnetic MHD generators, comparing cross sections
p0185 A73-24594
Optimizing power efficiency of hydrazine-oxygen fuel cells.
p0187 A73-29598
Direct current and electrodeless induction type magnetohydrodynamic power generators using liquid metals as working media optimized by means of variational calculus
[DLR-FB-67-71] p0193 N68-14746
Optimum Mariner spacecraft solar power system models
[NASA-CR-95263] p0050 N68-27974
Fuel cycle costs for varying designs of gas cooled fast breeder reactors
[GA-8032] p0081 N68-29161
Optimization of constant current electromagnet in MHD generator
[SM-74/83] p0210 N69-13317

- Satellite power system configurations for maximum utilization of power
[NASA-CR-100038] p0053 N69-18748
- Determining economic effectiveness of optimum nonregenerative gas turbines
[AD-683130] p0013 N69-26227
- Optimum geometric relationships in coaxial linear induction magnetohydrodynamic generator
[AD-685523] p0221 N69-29843
- Fabrication and test evaluation of lightweight solar panels
[NASA-CR-668322] p0055 N69-38646
- Optimal shielding criteria for nuclear apparatus onboard spacecraft
p0224 N69-38756
- Optimal systems for storage of solar energy after thermal conversion
p0056 N70-16229
- Optimization of linear nonequilibrium MHD generator
[AD-707803] p0237 N70-40031
- Examining fuel cycle codes using different techniques for fuel cost calculations
[BNWL-SA-3605] p0094 N71-21050
- Optimization of specific power highly efficient radioisotope thermoelectric generator
p0251 N73-16636
- ORBIT PERTURBATION**
Optimum configuration in large orbiting solar array design, considering configuration selection and environmental perturbations effects
p0023 A68-16784
- ORBITAL SPACE STATIONS**
NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects
[AIAA PAPER 71-825] p0174 A71-34720
- Electrical and isotope power from space for terrestrial use.
p0042 A73-18028
- Nuclear power for manned orbital space stations
[NASA-TM-X-52774] p0231 N70-25446
- ORBITAL WORKSHOPS**
Design of multispectral scanner for orbital earth resources detection
[NASA-CR-102111] p0089 N70-16407
- ORGANIC CHEMISTRY**
Advances in organic geochemistry 1971; Proceedings of the Fifth International Meeting, Hanover, West Germany, September 7-10, 1971.
p0076 A73-25459
- ORGANIC LIQUIDS**
Fluorocarbon fluid Rankine cycle system utilizing gas turbine exhaust heat for environmental control
[SAE PAPER 70-162] p0165 A70-25371
- ORGANIC MODERATED REACTORS**
Test evaluation of monoisopropyl diphenyl, and gas oil as organic reactor moderators
[FTD-HT-66-746] p0079 N68-12884
- OSCILLATION DAMPERS**
Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282] p0118 N72-13391
- OSCILLATORS**
Combustion oscillator for MHD energy conversion, using products flow modulation by traveling pressure wave
p0175 A71-38099
- OXIDATION**
Constant pressure apparatus for measuring oxygen absorption of petroleum hydrocarbons at high temperatures
[TG-230-T533] p0079 N68-15844
- Analysis of rate of oxidation of petroleum products in water under conditions where nitrogen, phosphorous, and potassium are present
[NLL-NSTIC-TRANS-2474-(6180.59)] p0097 N71-37701
- OXIDES**
Solid solution oxide fuels for space electric power heat systems
[LA-DC-9686] p0264 N69-14302
- OXYGEN**
Hydrazine-oxygen fuel cell design and operation, discussing efficiency, electrolyte space, etc
p0170 A70-43541
- Combustion products thermodynamic parameters for natural gas burning in oxygen atmosphere, plotting gas temperature and flow rates against pressure and excess oxidant ratio
p0075 A72-29451
- Minimum required energies for direct initiation of gaseous detonation waves in acetylene-oxygen mixtures
[BM-AI-7061] p0116 N68-12434
- Oxygen electrode kinetic factors in fuel cell energy conversion processes
p0199 N68-17824
- Oxygen electrodes for fuel cells, and mechanism in transport of oxygen near line separating gas electrolyte electrode
p0200 N68-18025
- Effectiveness of enriching air with oxygen in installations with MHD generators
[SM-74/201] p0211 N69-13327
- Experimental investigation of MHD generator
[SM-74/206] p0211 N69-13331
- Composition and thermodynamic properties of combustion products of methane and air-oxygen
[SM-74/217] p0082 N69-13334
- Cost estimates for manufacturing hydrogen and oxygen in water electrolysis and fossil fuel plants
p0117 N70-14511
- OXYGEN ANALYZERS**
Oxygen sensing and recombination electrodes tested for fuel cell application
[NASA-CR-100813] p0265 N69-24894
- OXYGEN CONSUMPTION**
Petroleum sulfides advantageous effect on oxygen consumption during combustion
p0072 A69-19456
- OXYGEN REGULATORS**
Proportional-integral control of reactants supply for hydrazine-oxygen fuel cells with pulse controlled solenoids
p0177 A72-18290
- P**
- P-I-N JUNCTIONS**
Edge irradiated p-i-n structure for use with high intensity controlled spectrum photovoltaic converters, considering output, series resistance and collection efficiencies
[AGARDOGRAPH 81] p0126 A68-22549
- P-i-n structure for controlled spectrum photovoltaic conversion of radiant to electric energy
p0199 N68-17830
- P-N JUNCTIONS**
Si p-n junction for solar energy conversion, comparing electrical and spectral response characteristics for B and P diffused impurities
p0024 A68-31623
- Solar conversion efficiencies of p-n and n-p diodes calculated for specified semiconductor heterojunctions using Anderson diffusion model
p0026 A69-30034
- CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption
p0034 A71-11896
- Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination
p0039 A72-34268
- Solar cell graded band gap materials, determining I-V characteristics, junction capacitance and photovoltaic spectral response
p0040 A73-14207
- New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell.
p0041 A73-14220
- Lithium-diffused p-n silicon solar cells of high conversion efficiency and improve resistance to space radiation effects
[NASA-CR-97077] p0051 N68-35814
- PACKAGING**
Mixed fission products potential as thermal and gamma energy sources
[BNWL-1115] p0224 N69-38506

PADDLES

Solar paddle configuration for large astronomical satellite and available power
[ESRO-TN-P-5/ESTEC/] p0052 N69-15891

PANELS

Mechanized module technique for fabrication of heat resistant solar cell collectors and panels
[RF-93-0] p0048 N68-22010
Annotated bibliography on solar cells and panels
[AD-700500] p0058 N70-29273
Solar panel test set for testing solar cells with artificial light source
[AD-707345] p0059 N70-38210
Method and apparatus for fabricating solar cell panels
[NASA-CASE-XNP-03413] p0062 N71-26726

PARABOLIC BODIES

Development of double mirror solar energy concentrator with nickel parabolic reflectors to increase maximum flux density
[AD-741880] p0064 N72-29046

PARABOLIC REFLECTORS

Parametric analysis of effects of concentrator surface errors and rim angle, collection system orientation error, and receiver temperature on paraboloid solar collector thermal efficiency
[NASA-TN-D-4415] p0047 N68-18998

PARABOLOID MIRRORS

Direct solar radiation concentration by paraboloid mirrors, analyzing energy transport and distribution functions, based on statistically distributed imperfections of reflecting surfaces
p0030 A70-10762
Performance of expandable whirling membrane solar energy concentrator for space power conversion
[NASA-TN-X-59872] p0049 N68-27564
Performance of expandable whirling membrane solar energy concentrator
[L-5484] p0049 N68-27926

PARAFFINS

Aromatic hydrocarbon influence on lubricity of petroleum oils, noting mixtures with paraffins, low loads scuffing and decomposition
p0071 A68-41768

PARAMAGNETISM

Paramagnetic cycles for low temperature superconducting magnet cooling, discussing refrigerator, cryogenic pumps, regenerators and adjustable heat source and sink
p0176 A71-40898

PARAMETERIZATION

Energy balance relationships used for evaluating maximum parameters of MHD generator operating on nonequilibrium plasma
[AD-726588] p0244 N71-37309

PARTICLE DIFFUSION

Fuel cells with solid membranes with ion conductivity, discussing proton electrolyte
p0156 A69-32424
Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency
p0041 A73-14213

PARTICLE INTERACTIONS

Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736

PATENTS

Book on solar cells U.S. patent literature, discussing Si semiconductors, panel fabrication techniques, photoemissive devices, Cd, Ga and organic compounds, etc
p0032 A70-22050

PAYLOADS

Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields
p0257 A73-33183

PELLETS

Design of prototype thermal battery incorporating pelletized alkaline heat source
[SC-RR-69-497-A] p0267 N73-21084

PELTIER EFFECTS

Test apparatus and technique for assessing Peltier thermoelectric cooling device operational characteristics
p0178 A72-27721

Thermoelectric generators theory, design and performance characteristics, discussing Seebeck, Peltier and Thomson effects
p0180 A72-31375

PENNSYLVANIA

EREP imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337
Digital processing of ERTS-1 data for identification of strip mining areas in west branch area of Susquehanna River and mine drainage in Pennsylvania
[PAPER-E3] p0110 N73-28267
Identification and mapping of coal refuse banks in Pennsylvania anthracite coal fields from ERTS-1 data
[PAPER-L24] p0110 N73-28319
Skylab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337
Mapping of anthracite wastes from mining in Pennsylvania
[E73-11107] p0112 N73-33264
Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania
[E73-11112] p0112 N73-33269

PERFORMANCE

Infinitely sequenced electrode thermoelectric direct energy conversion device performance and characteristics
p0119 A68-11941
Performance characteristics of electrofluid dynamic energy conversion processes, using viscous coupling between neutral molecules and electrically charged particles
[AGARDOGRAPH 81] p0124 A68-22535
Performance characteristics of electroballistic direct power generators
[AGARDOGRAPH 81] p0124 A68-22536
Potential in performance improvements in air breathing propulsion related to reliability, maintainability and cost
p0131 A68-33438
Effects of nonuniform gas flow on electrical performance of MHD generators
[AEC-TR-7102/3] p0245 N72-11610
Diode-diode for improving performance of nuclear thermionic systems
[NASA-TN-X-2586] p0248 N72-28685
Performance of closed cycle MHD generators
[AD-747661] p0250 N73-12068
Performance capabilities and cycle life of high specific energy batteries for pollution free electric vehicles
[ANL-7953] p0267 N73-19061

PERFORMANCE PREDICTION

Fuel cell system performance related to reactant properties, tabulating values for cell design factors
[AGARDOGRAPH 81] p0125 A68-22541
Molecular chemistry, statistical mechanics and plasma physics principles for theoretical output current and efficiency characteristics of vapor thermionic converters
p0130 A68-29729
Thermochemical MHD converter performance determined by slug model governed by differential equations
p0130 A68-29901
Liquid metal two phase flow MHD generators efficiency prediction, discussing end losses and flow velocity
p0148 A69-27485
Liquid metal MHD induction generators design and performance, considering effect of geometry, operating conditions, fluid properties and power level on efficiency
p0150 A69-27503
Solar arrays for Venus-Mercury flyby, evaluating temperature and power performance
p0033 A70-41010

PERFORMANCE TESTS

SUBJECT INDEX

Electrically-heated Brayton power conversion system, comparing performance tests with prediction p0173 A71-32212

Long life performance predictions for lead telluride and silicon germanium radioisotope thermoelectric generators for deep space missions p0175 A71-38925

Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakages and current distribution p0179 A72-29353

MHD power generators analytical modeling by digital technique for prediction of performance and efficiency as function of size and operating conditions [AD-741173] p0179 A72-29355

Numerical analysis method for performance prediction of linear induction machines including liquid metal MHD pumps and generators and linear motors p0179 A72-29365

Qualitative analysis of MHD energy conversion efficiency p0186 A73-27321

Computer program and mathematical model for calculating performance characteristics of solar thermoelectric energy conversion plate [NASA-CR-94615] p0049 N68-23987

Conference proceedings on performance predictions and technological developments for static energy conversion devices for space missions [AGARD-CP-21] p0203 N68-28714

Radiation damage and temperature dependence data on silicon solar cell arrays p0050 N68-28741

Phase impedance, power factor, performance characteristics, and working fluids studied for magnetohydrodynamic generators p0204 N68-29990

Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities [JPRS-46752] p0208 N69-11943

Linear approximation of finite length magnetohydrodynamic induction converter [UCRL-50537] p0221 N69-28635

Experimental and analytical comparison for 20 MW combustion-driven Hall configuration MHD generator [SR-344] p0231 N70-24132

Standard solar cells calibrated in respect of air mass zero short circuit current [ESRO-TN-79] p0058 N70-30210

Performance of actual solar cells compared with theoretical predictions p0058 N70-30229

Development of method for analyzing performance of magnetohydrodynamic generator based on thermodynamic properties and flow characteristics p0252 N73-19051

PERFORMANCE TESTS

Hydrazine-air fuel cells design features, auxiliary components and performance characteristics p0119 A68-13240

One megajoule inductive energy storage system using water cooled air core coil with optimum shape p0261 A68-23903

Liquid metal MHD power conversion system with Cs and Li as working fluids, describing hydraulic, electrical and high temperature tests results p0167 A70-39986

Performance comparison of diagonal conducting wall MHD generator and Hall generator of equal dimensions, investigating wall temperature effect p0169 A70-40004

Electrode size effects on combustion driven MHD generator performance, examining voltage losses, gas boundary layer temperature and surface conditions p0169 A70-40005

NASA Lewis closed loop MHD generator subsonic tests, discussing ducts, purge and Cs injection systems, electrode coating, etc p0169 A70-40011

High temperature fuel cell with thin disk solid electrolyte, evaluating performance as function of electrolyte, electrode and current collector resistance ratio p0170 A70-42499

High energy long shelf life lithium-nickel sulfide batteries performance tests p0262 A71-13041

Electrically-heated Brayton power conversion system, comparing performance tests with prediction p0173 A71-32212

Multihundred watt radioisotope thermoelectric generator for spacecraft power supply, discussing system design, performance and safety requirements p0176 A71-38927

Performance characteristics and limitations of electrode and insulation materials for open and closed cycle MHD generators, noting ceramic compositions for channel [AD-737019] p0178 A72-22401

Liquid metal regenerator design and test evaluation for gas turbine engine fuel consumption improvement [ASME PAPER 72-GT-33] p0178 A72-25629

Thermionic converters performance and life tests, discussing test equipment and diffusion effect on emitter stability p0180 A72-36139

Solar cell optical properties effects on electrical and thermal performance and cost savings in panel design optimization p0041 A73-14226

Solar array and supporting technologies development, discussing manufacturing, handling, design qualification tests in space environment and comparison between fold-up and roll-up types p0041 A73-14237

Thermoelectric panel array of hybrid thermocouples with p-type Si-Ge encapsulated PbTe/Si-Ge n-legs, presenting performance test results as function of test time p0184 A73-22766

Performance studies on a rechargeable hydrogen-oxygen fuel cell. p0186 A73-25988

TRANSIT radioisotope thermoelectric generator technology, discussing structural design, thermal efficiency, performance prediction, panel configurations and life test data p0186 A73-26034

NaK-nitrogen liquid metal MHD converter tests at 30 kW. p0188 A73-38311

Test evaluation of monoisopropyl diphenyl, and gas oil as organic reactor moderators [FTD-MT-66-746] p0079 N68-12884

Testing, fabrication, configuration selection, and electrical performance calculations in solar thermionic generator development [NASA-CR-92520] p0047 N68-16074

Performance and life test on thermionic converters and generators [NASA-CR-94154] p0201 N68-21597

Fabrication and test performance of solar thermionic collector-radiator heat pipe structure [NASA-CR-94402] p0048 N68-22991

Performance of expandable whirling membrane solar energy concentrator [L-5484] p0049 N68-27926

Construction and operation of magnetohydrodynamic power generation facility [NASA-CR-72477] p0208 N69-12307

Experimental results of 100 kW MHD generator [SM-74/212] p0210 N69-13325

Construction and performance tests of induction type liquid potassium magnetohydrodynamic generator [NASA-CR-97876] p0214 N69-13818

Electrode temperature effect on MHD generator performance [AD-683793] p0220 N69-27071

Fabrication and test evaluation of lightweight solar panels [NASA-CR-66832] p0055 N69-38646

Performance tests of 2-15 kilowatt Brayton power system using krypton [NASA-TN-X-52750] p0229 N70-19190

- Design and tests of MHD induction generator operating on liquid flow
[NASA-CR-110154] p0233 N70-29169
- Comparative performance analysis of linear MHD generators
[TUBIK-15] p0234 N70-32771
- Diagonal conducting wall generator and Hall generator performance
[AD-705159] p0235 N70-32986
- Performance tests of liquid metal magnetohydrodynamic power converter
p0241 N71-22560
- Design and performance of roll-up solar array engineering model
p0061 N71-22561
- Performance test on rollup solar array system and thermal bending tests on deployable boom
[NASA-CR-118006] p0061 N71-23714
- Evaluation of factors affecting performance of series connected magnetohydrodynamic generators
[AD-721455] p0242 N71-28718
- Design and development of 1.5 kilowatt fuel cell powerplant for field use
[AD-730796] p0246 N72-19040
- Solar array development discussing manufacturing, design qualification tests in aerospace environments, and comparison between fold-up and roll-up types
[RAE-TR-72109] p0067 N73-21959
- PERIODICALS**
Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics
p0084 N69-30776
- PERMEABILITY**
Pressure effects on filtration and permeability of heat carriers in earth core rocks
p0090 N70-16589
- PETROLOGY**
Survey on organic geochemistry origins and use of gas-liquid chromatography and mass spectrometry analyses of organic components isolated from crude oils and sediments
[NASA-CR-93111] p0079 N68-17316
- PHASE DIAGRAMS**
High temperature solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using solar furnace
p0032 A70-30907
- PHASE TRANSFORMATIONS**
Magnetohydrodynamic generator for mixing nonconductive gas and liquid metal mist to form slugs
[NASA-CASE-XLE-C2083] p0225 N69-39983
- PHOSPHORIC ACID**
The phosphoric acid fuel cell, a long life power source for the low to medium wattage range.
p0184 A73-22821
- PHOTOCONDUCTIVITY**
Semiconductor solar energy converter, deriving conditions for occurrence of photoconductivity quenching
p0034 A70-46325
- Analysis of semiconductor with two impurity levels to exchanging current carriers to determine conditions for occurrence of photoconductivity quenching
[AD-743031] p0064 N72-31083
- PHOTODIODES**
Photodiode efficiency in photovoltaic generators, investigating series resistance influence and means of improving cell performance
[AGARDOGRAPH 81] p0125 A68-22547
- GaAs photoelectric devices for radiation detection and light to electric energy conversion, considering photoresistors, photodiodes and solar cells
p0026 A69-27465
- Photovoltaic efficiency of photodiodes in solar cells
p0199 N68-17828
- PHOTOELECTRIC CELLS**
Reliability analysis of solar thermoelectric generator module as function of individual photocells, circuit design and redundancy
p0036 A71-31672
- Solar to electric energy conversion efficiency and electrical properties of photoconverters using compressed sintered CdS
p0036 A71-44390
- Technology for fabricating cadmium telluride solar photoelectric cells with improved energy conversion efficiency
p0050 N68-28744
- Germanium solar photoelectric cells for high intensity solar energy conversion devices
p0050 N68-28746
- Analysis of semiconductor with two impurity levels to exchanging current carriers to determine conditions for occurrence of photoconductivity quenching
[AD-743031] p0064 N72-31083
- Analysis of silicon solar cells to show factors controlling blue response and methods for improvement
[NASA-CR-131090] p0066 N73-19059
- PHOTOELECTRIC EFFECT**
Photoeffect efficiency of solar energy converters based on semiconductor cadmium sulfide-copper sulfide heterojunctions
p0036 A71-42536
- Solar cells with improved photoelectric efficiency, describing use of noncorroding Ti-Pd-Ag contacts, titanium oxide antireflection layer and welded cell joints
p0037 A72-17751
- PHOTOELECTRIC GENERATORS**
GaAs photoelectric devices for radiation detection and light to electric energy conversion, considering photoresistors, photodiodes and solar cells
p0026 A69-27465
- Faceted reflector for solar power installations with photoelectric converters, discussing reflector construction, efficiency and energy balance
p0027 A69-32798
- Photoelectric composite multicell solar generator, deriving empirical equation for external I-V characteristic
p0031 A70-19623
- Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide, discussing preparation methods and photoelectric and electric properties
p0033 A70-36238
- PHOTOGRAMMETRY**
Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner
p0074 A72-16600
- PHOTOINTERPRETATION**
Physical interpretation of geology, hydrology, and glaciology revealed by ERTS-1 imagery of east central Ohio
[E73-10454] p0106 N73-20413
- PHOTOMAPPING**
Mapping of strip mine areas in southeastern Ohio from ERTS-1 imagery
p0110 N73-28372
- PHOTOSENSITIVITY**
CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption
p0034 A71-11896
- Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response
p0039 A72-30225
- PHOTOSYNTHESIS**
Biological conversion of solar energy, discussing photosynthesis and nonphotosynthesis mechanisms
p0032 A70-31690
- PHOTOVOLTAIC CELLS**
Photodiode efficiency in photovoltaic generators, investigating series resistance influence and means of improving cell performance
[AGARDOGRAPH 81] p0125 A68-22547
- Photovoltaic cell geometrical and electrical parameters analysis, considering conversion efficiency and spectral adaptation
[AGARDOGRAPH 81] p0125 A68-22548

- Edge irradiated p-i-n structure for use with high intensity controlled spectrum photovoltaic converters, considering output, series resistance and collection efficiencies [AGARDGRAPH 81] p0126 A68-22549
- CdS thin film solar cell noting advantages over silicon photovoltaic cells for converting light into electric energy p0024 A68-34613
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1] p0141 A69-16158
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1] p0028 A69-36418
- Cadmium telluride photocells, discussing performance and mass production p0167 A70-38481
- Si solar cells lightweight economical deployable arrays, discussing temperature performance, assembly, coverslips, interconnection, stowage and telescopic mast and ends p0034 A71-16099
- Si solar cell technology, discussing contacts, low temperature performance and conversion efficiency p0034 A71-16103
- French R and D programs on Si and various thin film photovoltaic solar cells, considering efficiency, reliability, and weight and cost reduction problems p0037 A72-28002
- Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. p0040 A73-14203
- Laser energy conversion into electrical energy with photovoltaic cells, noting Si and GaAs cells power efficiencies improvement compared to operation in sunlight p0049 A73-14210
- A model of a thermophotovoltaic radionuclide battery. p0185 A73-23279
- Near-equatorial synchronous orbit Satellite Solar Power Station system with photovoltaic cell arrays energy conversion into microwave power for transmission to earth p0043 A73-23601
- Principles of photovoltaic solar energy conversion. p0044 A73-29591
- Photovoltaic efficiency of photodiodes in solar cells p0199 N68-17828
- Conversion efficiency of photovoltaic cells for converting luminous into electrical energy p0199 N68-17829
- P-i-n structure for controlled spectrum photovoltaic conversion of radiant to electric energy p0199 N68-17830
- Design techniques for solar generators based on silicon photovoltaic cells p0050 N68-28740
- Photovoltaic cells for converting solar energy to electrical energy p0056 N70-16228
- Photovoltaic solar energy conversion p0058 N70-30228
- Maximum efficiency of solar energy conversion for photovoltaic cells p0248 N72-27058
- Feasibility of using photovoltaic cells to convert laser energy into electrical energy [LA-DC-72-468] p0265 N73-12061
- PHOTOVOLTAIC CONVERSION**
- Efficiency and performance limiting factors of single crystal and polycrystalline thin film cells p0121 A68-17793
- Radiophotovoltaic devices power and energy conversion efficiency limits, investigating phosphors deterioration and nuclide layer optimal thickness p0185 A73-23280
- Historical review of scientific work on photovoltaic effects and on energy conversion devices using this effect [NASA-CR-92679] p0047 N68-16882
- Thermionic and photovoltaic energy conversion p0200 N68-21052
- Design and performance of photovoltaic power system on Nimbus 2 spacecraft [NASA-CR-62045] p0202 N68-24455
- Solar, chemical, and nuclear energy as space power system primary energy sources p0056 N70-11393
- Photovoltaic solar energy conversion p0058 N70-30228
- Three major options for wide-scale generation of photovoltaic energy for terrestrial use [NASA-CR-128381] p0065 N72-33061
- PHOTOVOLTAIC EFFECT**
- Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination p0027 A69-35679
- Solar cell graded band gap materials, determining I-V characteristics, junction capacitance and photovoltaic spectral response p0040 A73-14207
- Investigations of the inhomogeneity of polycrystalline Cu_x/S-CdS solar cells. p0041 A73-14222
- Radioisotopic energy conversion by radiovoltaic effect, describing titanium-tritium sources and semiconductor converter p0185 A73-23278
- Historical review of scientific work on photovoltaic effects and on energy conversion devices using this effect [NASA-CR-92679] p0047 N68-16882
- Physical processes underlying solar-energy conversion through photovoltaic effect p0064 N72-27057
- PHYSICAL PROPERTIES**
- Degradation, dispersion and movement of oil slicks by wind and ocean as factors influencing applicability of countermeasures [WMO-359] p0112 N73-32300
- PHYSICAL WORK**
- Chemical energy conversion into mechanical work, examining irreversible mixing, Van Hoff box and Carnot cycle p0171 A71-16785
- Chemical energy conversion into mechanical work, examining irreversible mixing, van Hoff box and Carnot cycle p0174 A71-33037
- PILOT PLANTS**
- Pilot plant for solvent extraction of strontium 90 from fission products [EUR-3613.7] p0078 N68-10864
- Pilot plant for demonstrating nozzle separation method for uranium enrichment [NP-TF-1884] p0094 N70-39255
- PIPE FLOW**
- Development of nuclear thermionic space power system using thermionic diodes, and heat pipe flow for temperature control [NASA-TN-D-4299] p0200 N68-19146
- PIPELINES**
- Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields p0257 A73-33183
- Frictional pressure loss measurements in horizontal pipelines for coal/water transport p0092 N70-29067
- PIPES (TUBES)**
- Petroleum mechanical engineering and pressure vessels and piping - ASME Conference, Denver, September 1970 p0262 A71-14767
- Characteristics of protective effect of petroleum soluble corrosion inhibitors for iron in electrolyte hydrocarbon two-phase system [AD-694781] p0258 N70-14391
- PISTON ENGINES**
- Comparison of Wankel engine characteristics with small reciprocating and jet engines used as power plants in light aircraft [REPT-908] p0247 N72-20764
- PLANETARY SURFACES**
- Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets [SM-112/25] p0085 N69-30899

PLANOTRONS

High efficiency and power long life cross field amplifier generator for solar energy conversion in space into microwave, discussing magnetron and amplitron

p0935 A71-28668

PLASMA ACCELERATORS

Continuous electrode Faraday diagonal conducting wall and Hall MGD accelerators and generators performance characteristics

p0119 A68-12258

Hall type electromagnetic plasma accelerator, with thrust affected only by Lorentz forces in external magnetic field, compared to pure Hall accelerator

p0146 A69-25214

Plasma generators and plasma research in Denmark

p0216 N69-18448

Analysis of magnetoplasma dynamic converters

[AEC-TR-7161] p0239 N71-15010

Crossed field MHD plasma generator-accelerator

[NASA-CASE-XLA-C3374] p0239 N71-15562

Direct current powered self repeating plasma accelerator with interconnected annular and linear discharge channels

[NASA-CASE-XLA-03103] p0240 N71-21693

Principles of magnetohydrodynamic energy

generation to include flows in magnetohydrodynamic generator, physical processes, diagnostics, and required equipment - Part 1

[JPRS-57940-1-PT-1] p0251 N73-16687

Principles of magnetohydrodynamic energy

generation to include open and closed cycle magnetohydrodynamic generators, liquid-metal plants, and materials for generators -Part 2

[JPRS-57940-2-PT-2] p0251 N73-16688

PLASMA CONDUCTIVITY

Diluent gas effect on alkali metal seeded rare gas nonequilibrium plasmas conductivity at various pressures, noting working fluid suitability in MHD generators

p0123 A68-20829

Closed cycle MHD experimental facility characteristics, discussing seeding, Faraday and Hall voltage measurements and plasma conductivity

p0127 A68-23929

High effective electrical conductivity and power densities in closed cycle MHD power generation, considering effect of local nonequilibrium ionization

p0133 A68-40538

Potassium seeded argon plasma conductivity in induced electric field at static gas temperature for MHD generator model

p0141 A69-17909

Ar-K plasma studied as possible MHD generator working fluid by investigating influence of emission and external magnetic field on nonequilibrium electrical conductivity

p0143 A69-23441

Turbulent plasma near stability limit in MHD generator with constant load coefficients, noting effective conductivity and effects of gas temperature

p0144 A69-23460

Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance

p0144 A69-23463

Faraday type MHD energy converters in nonequilibrium conduction mode, analyzing two dimensional current and potential distributions in plane normal to magnetic field

p0146 A69-25397

Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics

[AD-674611] p0012 N69-13314

Nonequilibrium conductivity of plasma in MHD generator

[SM-74/104] p0210 N69-13324

Volt-Ampere characteristics of MHD channel with different electrodes

[SM-74/209] p0211 N69-13332

Electrical conductivity of plasma in MHD generator

[SM-74/236] p0213 N69-13346

Electric arcs in ionized and nonionized gas stream

[SM-74/238] p0213 N69-13347

Ionospheric MHD generator based on utilizing solar energy

[JPRS-46941] p0214 N69-13670

Magnetohydrodynamic flow in MHD ducts from point of view of boundary layer and shock wave theory

[AD-703158] p0219 N69-26242

Electrical conductivity of plasma on magnetohydrodynamic generator, and spectroscopic analysis of argon and cesium plasma

[AD-703158] p0236 N70-36408

PLASMA CONTROL

Power production based on controlled fusion of deuterium and tritium nuclei, noting use of magnetic bottle for plasma confinement

p0131 A68-32685

Nuclear fusion reactor development, discussing magnetic field confinement of hot dense plasmas and electric power production economic possibilities

p0142 A69-20124

Current and proposed experiments on magnetic mirror confinement of fusion plasmas

[TID-24254] p0203 N68-29063

Feasibility of power by nuclear fusion

[ORNL-TN-2204] p0204 N68-30162

Plasma production and heating by laser radiation with plasma control and production of thermonuclear plasma discussed

[NP-17453] p0204 N68-30330

Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings

[MATT-659] p0218 N69-23954

Thermonuclear power reactor design using lithium blanket for plasma control and regeneration of tritium fuel consumed in basic reaction

[UCRL-71500] p0226 N70-12638

Passive circuit grids for stabilization of magnetohydrodynamic generator plasma

[TR-72-E-31] p0253 N73-23757

PLASMA DIAGNOSTICS

High temperature plasmas and attempts to achieve controlled thermonuclear fusion, discussing plasma properties

p0132 A68-38740

Diagnostic techniques for determining MHD generator plasma electron density, conductivity, gas and electron temperature, velocity and Hall coefficient

p0133 A68-39726

Plasma diagnostics in energy conversion

p0196 N68-17809

Plasma research and diagnostics, turbulent and Hartmann flow, electrostatic probes, argon plasma, electron transport and energy and related topics

[AFOSR-68-0859] p0202 N68-26537

Magnetohydrodynamic flow, boundary layers, and plasma diagnostics in MHD ducts

[JPRS-48041] p0219 N69-26241

Calculation of boundary layer at electrode of MHD generator

p0219 N69-26243

Development of plasma diagnostic methods applied to direct energy converters

[AD-702405] p0233 N70-29012

Development of cesium seeding techniques, large MHD magnets, plasma diagnostic techniques, and thermionic electrodes compatible with shock tube MHD generators

[AD-711351] p0238 N71-10992

Pulsed ionization chamber for plasma diagnostics, and applications to MHD electrical power generation from gas cooled reactors

[AD-747681] p0250 N73-12800

Principles of magnetohydrodynamic energy generation to include flows in magnetohydrodynamic generator, physical processes, diagnostics, and required equipment - Part 1

[JPRS-57940-1-PT-1] p0251 N73-16687

Principles of magnetohydrodynamic energy generation to include open and closed cycle magnetohydrodynamic generators, liquid-metal plants, and materials for generators -Part 2

[JPRS-57940-2-PT-2] p0251 N73-16688

PLASMA DYNAMICS

- Plasma expansion in uniform guide field and plasma flow kinetic energy conversion to thermal energy by shock wave due to magnetic barrier p0134 A68-41790
- Plasma dynamics experiments related to controlled nuclear fusion p0209 M69-13069
- Properties of mercury cesium plasma in crossed electrical and magnetic fields [SM-107/13ⁿ] p0214 M69-15430
- Plasma generators and plasma research in Denmark p0216 M69-18448
- Magnetohydrodynamic problems in transformation of energy [AD-699661] p0231 N70-25577
- Feasibility of potassium-cesium mixture for seeding magnetohydrodynamic combustion plasma [PB-214314/71] p0253 N73-25102
- PLASMA ELECTRODES**
- Electrode end effects on plane flow of electrically conducting fluid in MHD generator, determining current and electrical potential functions p0120 A68-16360
- Electrode and boundary layer temperature effects on MHD generator performance, investigating energy transfer from working fluid to external load p0132 A68-39715
- Current and voltage distribution around normal shock in MHD duct using conformal transformation, considering continuous and sequenced electrode boundary conditions p0146 A69-25359
- MHD power generation, investigating replenishment of zirconia electrodes from plasma in open flame and duct configurations p0166 A70-30535
- Combustion driven Hall configuration MHD generator, discussing boundary layer analysis, gas density nonuniformity and electrode drop p0168 A70-40003
- Electrode size effects on combustion driven MHD generator performance, examining voltage losses, gas boundary layer temperature and surface conditions p0169 A70-40005
- Self regenerating molten seed electrodes for open cycle MHD power generators longevity, regulating combustion chamber and gas flow seeding p0178 A72-18336
- Performance characteristics and limitations of electrode and insulation materials for open and closed cycle MHD generators, noting ceramic compositions for channel [AD-737019] p0178 A72-22401
- Linear nonequilibrium Faraday type MHD generator, predicting electrode configuration effects on voltage drops, axial leakage and current distribution p0179 A72-29353
- Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition p0190 A73-39619

PLASMA GENERATORS

- MHD power generator using nonequilibrium plasma generated by inductively coupled RF electric fields, noting plasma diagnostic techniques p0133 A68-41161
- Plasma generation and heating by controlled thermonuclear fusion reactions using pulsed lasers p0164 A70-22249
- Pulsed power - A new technology for controlled thermonuclear fusion. p0181 A72-36332
- Pulsed laser produced high temperature plasma for electric power generation by controlled nuclear fusion, discussing gas dynamic model p0181 A72-43723
- Magnetohydrodynamic generator design trends [FTD-HT-66-378] p0192 M68-13094
- Nonequilibrium modes of operation for magnetohydrodynamic energy converters p0197 M68-17811
- Nonequilibrium electron mode for kilowatt range magnetoplasma dynamic generation of space power p0197 M68-17812

- Design and construction of ARGAS experimental magnetohydrodynamic generator at nuclear research facility Juelich, Germany [JUL-510-TP] p0201 M68-21331
- Plasma production and heating by laser radiation with plasma control and production of thermonuclear plasma discussed [NP-17453] p0204 M68-30330
- Construction and operation of magnetogasdynamic power generation facility [NASA-CR-724777] p0208 M69-12307
- Crossed field MHD plasma generator-accelerator [NASA-CASE-XLA-03374] p0239 M71-15562
- Experimental and computational investigations of direct conversion of plasma energy to electricity [CONF-710607-126] p0244 M71-38463

PLASMA HEATING

- Plasma heating by fast hydromagnetic wave, measurements of diamagnetic pressure determine efficiency for RF power conversion into thermal energy p0122 A68-19482
- Plasma generation and heating by controlled thermonuclear fusion reactions using pulsed lasers p0164 A70-22249
- Laser energy absorption by plasma for controlled thermonuclear fusion, comparing uses of electrically pumped gas, chemical and solid state lasers p0187 A73-35379
- Estimation of power requirement of plasma heating in self-sustaining toroidal fusion devices [MATT-803] p0246 M72-11641

PLASMA INTERACTIONS

- Traveling transverse magnetic field interaction with rigid conducting spheres or cylinders, discussing electromechanical characteristics and MHD energy conversion applications p0129 A68-26140

PLASMA JETS

- Coaxial plasma source energetic characteristics, establishing plasmoid energy linear dependence on battery stored energy p0115 A72-26754
- Hollow cathode operation and plasma discharge in mercury ion engine, potential distribution of glow discharge, and liquid metal MHD power conversion p0214 M69-16485

PLASMA PHYSICS

- Book on MHD energy conversion covering conductivity, fluid mechanics, thermal and nonequilibrium ionization, Hall effect, aerospace applications, etc p0134 A68-42500
- Soviet collection of papers on MHD method of obtaining electrical energy, noting plasma properties in MHD generators p0141 A69-17905
- Engineering aspects of magnetohydrodynamics: Proceedings of the Thirteenth Symposium, Stanford University, Stanford, Calif., March 26-28, 1973. p0188 A73-38310
- Russian book - Physical bases of thermaionic energy conversion. p0190 A73-41876
- Generalized Saha equation for nonequilibrium two temperature plasmas p0197 M68-17813
- Research studies in plasma physics, thermonuclear reactions, and magnetohydrodynamic generators [AFOSR-68-1377] p0206 M68-31928
- Numerical calculation methods for various plasma physics and controlled fusion problems [UCRL-71205] p0207 M68-35919
- Materials, plasma, and electrochemical engineering for energy conversion [NASA-CR-103989] p0223 M69-34810
- Nuclear seeded magnetohydrodynamic plasmas for electron kinetics using helium 3 [AD-690542] p0225 M69-39863
- Fundamental processes occurring in thermaionic energy converters related to overall converter performance [AD-700945] p0232 M70-26947
- MHD methods of obtaining electrical energy [AD-706160] p0236 M70-37638

- Vibrational excitation of nonequilibrium magnetohydrodynamic generator [AD-740572] p0248 N72-29734
- PLASMA PINCH**
Explaining Tokamak stability by elimination of MHD instabilities when cylindrical Bennett pinch bent into torus [ORNL-TM-2766] p0230 N70-19953
- PLASMA POWER SOURCES**
MHD power generation, commercial and space applications and potential thermal pollution reduction p0138 A68-42581
- Plasma core reactor and inductive magnetohydrodynamic converter for power generating system [DLR-FB-67-59] p0191 N68-11139
- High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters [NASA-TT-P-11825] p0205 N68-30811
- Principles of magnetohydrodynamic energy generation to include flows in magnetohydrodynamic generator, physical processes, diagnostics, and required equipment - Part 1 [JPRS-57940-1-PT-1] p0251 N73-16687
- Principles of magnetohydrodynamic energy generation to include open and closed cycle magnetohydrodynamic generators, liquid-metal plants, and materials for generators -Part 2 [JPRS-57940-2-PT-2] p0251 N73-16688
- PLASMA SPECTRA**
Potassium seeded argon plasma conductivity in induced electric field at static gas temperature for MHD generator model p0141 A69-17909
- PLASMA SPRAYING**
Reports on electric automobiles, plasma spraying, sintering, and vapor deposition thickness measurements p0265 N69-34688
- PLASMA TEMPERATURE**
MHD generator mounted at shock tube downstream used to obtain magnetically induced ionization, considering minimum initial equilibrium electron density p0126 A68-23120
- Optimal conditions for energy conversion in MHD generator, observing ion seeding effect on plasma temperature p0177 A72-11207
- Experimental investigation of the characteristics of a nonequilibrium MHD generator p0190 A73-39618
- Experimental investigation of MHD generator [SM-74/206] p0211 N69-13331
- PLASMA TURBULENCE**
Turbulent plasma near stability limit in MHD generator with constant load coefficients, noting effective conductivity and effects of gas temperature p0144 A69-23460
- Ionization turbulence effect on nonequilibrium plasma MHD generator performance, using I-V characteristics equation p0179 A72-29354
- PLASMA-ELECTROMAGNETIC INTERACTION**
MHD generator induced magnetic field and end effects, considering electrically conducting fluid expansion in rectangular tube under external magnetic field p0126 A68-22803
- Inert gas nonequilibrium MHD power generation in shock tube p0140 A69-12425
- PLASMA-PARTICLE INTERACTIONS**
Plasma dynamics experiments related to controlled nuclear fusion p0209 N69-13069
- PLASMAS (PHYSICS)**
Coaxial plasma source energetic characteristics, establishing plasmod energy linear dependence on battery stored energy p0115 A72-26754
- High temperature energy systems with plasma reactors and magnetoplasma-dynamic generators for energy converters [NASA-TT-P-11825] p0205 N68-30811
- Thermal diffusion of materials, magnetoplasma studies, and electrochemical processes for purpose of energy conversion by unconventional techniques [NASA-CR-97473] p0207 N69-10111
- Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamic [AD-674611] p0012 N69-13314
- Abstracts for symposium on uranium plasma research [NASA-CR-107857] p0229 N70-17651
- Comparative performance analysis of linear MHD generators [TUBIK-15] p0234 N70-32771
- Operating characteristics of large nonequilibrium MHD generator with cesium seeded noble gases and heated electrodes [AD-719381] p0241 N71-24680
- Experimental and computational investigations of direct conversion of plasma energy to electricity [CONF-710607-126] p0244 N71-38463
- Model study of magnetohydrodynamic generator using argon-potassium plasma [AD-728591] p0246 N72-13698
- Bibliography on controlled fusion and plasma physics [TID-3557-1971-SUPPL] p0250 N73-12785
- PLASTICS**
Plastic substrate, cadmium sulfide thin film solar cell [NASA-CR-72534] p0054 N69-23369
- PLUMES**
Plume diffusion measurements at medium range from continuous point source p0012 N68-38392
- PLUTONIUM**
Fuel cost program for use of plutonium in thermal reactors [EUR-3890.1] p0081 N68-23663
- Results from USABC plutonium utilization programs conducted by Battelle-Northwest [BNWL-SA-2065] p0082 N69-15237
- Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry [CONF-680610] p0087 N69-37355
- PLUTONIUM FLUORIDES**
Fluoride volatility processes for chemical separation and purification of plutonium from waste materials [RFP-1048] p0080 N68-19265
- PLUTONIUM OXIDES**
Thermoelectric nuclear batteries fabrication in milliwatt power range combining bismuth telluride thermopiles with plutonia fuel capsules p0188 A73-38410
- Cost estimates for preparation and fabrication of solid-gel metal-clad uranium and plutonium oxide fuel elements [ORNL-TM-1979] p0078 N68-12553
- Criticality calculations for plutonium oxide radioisotope heat source [MLM-1532] p0082 N69-15081
- Fuel treatment by selective volatilization of uranium and plutonium fluorides [CEA-CONF-1195] p0083 N69-25510
- Research in Japan for developing fast reactor mixed oxide nuclear fuels [NLL-DOURRE-TRANS-419-/9091.9F/] p0091 N70-21080
- Helium release from plutonium-238 dioxide fuels for radioisotope thermoelectric generator heat sources [SC-RR-69-662] p0091 N70-21251
- Cost analysis for reprocessing of irradiated plutonium and uranium mixed oxides [CEA-CONF-1534] p0093 N70-39139
- Utilization of neutron radiation from PuO₂ decay to provide spacecraft electric power [NASA-CR-127045] p0101 N72-26528
- PLUTONIUM 238**
Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources. p0188 A73-38389
- Multihundred watt radioisotope thermoelectric generator design for on-pad and orbital conditions, discussing configurations, Pu-238 heat source and operating characteristics p0189 A73-38419

- Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection
p0189 A73-38422
- Plutonium isotope reentry vehicle experimental design study
[NASA-CR-72366]
p0081 N68-25283
- Preliminary design and performance considerations for 25 kW Pu 238 heat source isotope reentry vehicle
[NASA-CR-72555]
p0223 N69-34989
- POINT SOURCES**
Relative dose factors from long period point source emissions of atmospheric pollutants
p0011 N68-38380
- Plume diffusion measurements at medium range from continuous point source
p0012 N68-38392
- POINTING CONTROL SYSTEMS**
Passive solar array orientation devices for terrestrial application.
p0043 A73-22440
- POLARIZATION (CHARGE SEPARATION)**
High power density hydrazine-oxygen fuel cell, discussing cell polarization, critical resistance losses and efficiency
p0188 A73-38398
- POLARIZATION CHARACTERISTICS**
Performance studies on a rechargeable hydrogen-oxygen fuel cell.
p0186 A73-25988
- POLLUTION**
Pollution free hybrid fossil nuclear fueled magnetohydrodynamic power cycle
[BNL-12315]
p0202 N68-26381
- Method for handling large volumes of solid wastes in future
[CONF-691108-2]
p0015 N70-37081
- Documentation of Congressional Subcommittee testimony regarding Navy oil sludge pollution off Florida coast
p0096 N71-35178
- Conversion of solar energy to pollution free power
p0019 N73-13870
- Effect of fuel zoning and fuel nozzle design on exhaust pollution emissions at ground idle conditions for double-annular ram-induction combustor for turbofan engines
[NASA-CR-121094]
p0104 N73-17916
- POLONIUM 210**
SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
p0137 A68-42528
- POLYCRYSTALS**
German Si and polycrystalline solar cells development survey, discussing interconnection techniques, module design and filter applications for performance improvements
p0037 A72-28003
- POLYIMIDE RESINS**
Fabricating large solar array of thin silicon cells mounted on Kapton polyimide film with 560 W output
[RAE-TR-69007]
p0060 N71-11063
- POLYIMIDES**
560 W deployable solar array consisting of very thin Si solar cells mounted on polyimide film, initiating deployment by duplicated pyrotechnic actuators
p0028 A69-35707
- POLYMERIC FILMS**
560 W deployable solar array consisting of very thin Si solar cells mounted on polyimide film, initiating deployment by duplicated pyrotechnic actuators
p0028 A69-35707
- Solar energy transmission measurements of plastic films used as solar cells for weather balloons
[NASA-CR-73711]
p0053 N69-16975
- Design of solar energy concentrators with concentric circular seams of plastic films
[AD-755829]
p0067 N73-21712
- POLYMERS**
Electrolytic hydrogen fuel production with solid polymer electrolyte technology.
p0116 A73-38413
- PONDEROMOTIVE FORCES**
Ponderomotive forces acting upon conductive bodies in traveling magnetic field of cylindrical inductor, and effect on magnetohydrodynamic generator design
p0195 N68-16292
- POPULATIONS**
Projected future world energy requirements, resources, and need for breeder and fusion reactors
[BEPT-69-11]
p0013 N69-35574
- POROUS MATERIALS**
Catalytic load carrying capacity of porous carbon electrodes impregnated with nickel salt and nickel boride in anodic fuel cell hydrazine oxidation
p0164 A70-24469
- Performance studies on a rechargeable hydrogen-oxygen fuel cell.
p0186 A73-25988
- Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition
p0190 A73-39619
- Heat transfer from radioisotope capsules buried in porous materials
[AD-691213]
p0225 N69-40031
- PORPHYRINS**
Gas chromatography and mass spectrometry applied to porphyrin microanalysis, studying homologous porphyrin series in ancient sediments and oils
p0073 A70-12516
- PORTABLE EQUIPMENT**
Batteries and fuel cells as portable and transportable electrochemical power sources
p0171 A70-46399
- Feasibility of mobile nuclear reactor power plants for cargo transportation and development of remote regions on earth
[NASA-TN-X-68164]
p0020 N73-15693
- POSITION (LOCATION)**
Accurate localization by the Geole Project satellite
p0075 A73-17192
- POTASSIUM**
Experimental investigation of the characteristics of a nonequilibrium MHD generator
p0190 A73-39618
- Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition
p0190 A73-39619
- Electric conductivity in argon potassium and helium potassium plasmas with elevated electron temperature in crossed electric and magnetic fields
[IPP-3/59]
p0190 N68-10892
- Nonequilibrium ionization in potassium gas magnetohydrodynamic generator
[AI-67-138]
p0192 N68-11928
- Model study of magnetohydrodynamic generator using argon-potassium plasma
[AD-728591]
p0246 N72-13698
- Feasibility of potassium-caesium mixture for seeding magnetohydrodynamic combustion plasma
[PB-214314/7]
p0253 N73-25102
- POTASSIUM HYDROXIDES**
Design, testing, and performance of 5-kilowatt hydrazine/potassium hydroxide air fuel cell modules
[NRB4026F]
p0191 N68-11503
- POTENTIAL ENERGY**
Potential distribution in channel of liquid metal conduction MHD machine, examining electromagnetic channel pressure
p0130 A68-29187
- Photovoltaic cells for converting solar energy to electrical energy
p0056 N70-16228
- POTENTIAL FIELDS**
Potential distribution measurement in duct with propane/oxygen combustion gas flow in argon plasma MHD generator
p0128 A68-24872
- Measurements of potential and current density distributions in simulated Faraday-type MHD generator working with argon-potassium plasma
[IPP-3/104]
p0234 N70-31285

POTENTIAL THEORY

Fundamental processes occurring in thermionic energy converters related to overall converter performance
[AD-700945] p0232 N70-26947

POTOMAC RIVER VALLEY (MD-VA-WV)

Digital analysis of ERTS-1 data to determine sedimentation levels in Potomac and Anacostia Rivers confluence and strip mining in Allegheny County, Maryland
[PAPER-E131] p0110 N73-28277

POWER CONDITIONING

Concept for a high voltage solar array with integral power conditioning.
p0044 A73-26001

POWER EFFICIENCY

Optimal power conversion from solar array to spacecraft battery, obtaining power coupling by using high efficiency switching techniques
p0023 A68-17380

Performance characteristics of single wavelength liquid metal MHD induction generator with end loss compensation, determining electrical losses and power production
p0122 A68-19849

Two terminal operation of diagonal conducting wall and Hall generators under identical gas dynamic channel entrance conditions and magnetic field configurations
p0127 A68-23920

One wave induction MHD converter performance advantages over uncompensated multiwave converter balanced by friction losses and inductive power requirements
p0128 A68-23932

Collector temperature influence on maximum efficiency of thermionic converter in series battery
p0025 A68-43817

Thermoelectric power generators energy output efficiency, discussing thermal and electric contact resistances influence for optimizing parameters
p0147 A69-26364

Single wavelength design with compensation compared to multiwavelength design without compensation for liquid metal MHD induction converter, discussing optimization
p0150 A69-27504

Solar cell characteristics at low temperatures, noting efficiency increase with decreasing temperature
p0027 A69-35691

Thermoelectric power generator with variable thermal conductivity and electrical resistivity, obtaining steady state temperature distribution, power output and thermal efficiency
p0157 A69-40131

Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage
p0164 A70-21274

MHD generators optimum load selection by method of stepwise approach, noting agreement with pressure and density distributions to yield maximum power
p0164 A70-24156

Fuel cells power density improvement under pulsed loading at high current density and constant voltage
p0166 A70-27758

EGD energy converter system geometries for maximum power efficiencies, comparing slender conversion channels, abrupt expansion, free jet and divergent for operating characteristics
p0167 A70-30536

Optimal load circuits number for maximum power extraction from Hall MHD generator with nonuniform gas flow along channel
p0170 A70-44900

Hydrazine-oxygen fuel cells energy costs minimization by optimizing diaphragm thickness, hydrazine concentration and load
p0171 A71-14321

Hall MHD generator duct optimization, using digital calculation for Carter integral minimum for size under required power output
p0172 A71-23441

High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature
p0172 A71-24218

Brayton cycle power conversion system using He-Xe gas mixture, discussing compressor net engine and turbine static efficiencies
p0175 A71-38908

Hydrogen resistojet design and testing with Re heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer
[AIAA PAPER 72-449] p0115 A72-26186

MHD power generators analytical modeling by digital technique for prediction of performance and efficiency as function of size and operating conditions
[AD-741173] p0179 A72-29355

Thermal-to-electric power conversion efficiency of nonequilibrium MHD generator with Cs seeded noble gases, considering electrode configuration and gas dynamic effects
p0179 A72-29356

Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination
p0039 A72-34264

Output performance of a thermionic converter with an oriented tungsten /110/ emitter and a polycrystalline tungsten collector.
p0180 A72-34604

Laser beam power transmission to lunar bases or spacecraft from nuclear fueled satellite power station, discussing achievable ranges and efficiencies
p0257 A72-35328

Si solar cell design for high power/weight ratio and extreme environmental operating conditions, describing technological innovations for reliability and efficiency enhancement
p0039 A72-37780

High-efficiency Ga/1-x/Al/x/As-GaAs solar cells.
p0040 A73-10132

Effect of heterogeneity and Hall current on the MHD power generator.
p0182 A73-10434

Superconducting magnet ac generators development, emphasizing conversion efficiency, manufacturing, relative costs, machine geometry and interwinding coupling factor effects
p0182 A73-11833

Laser energy conversion into electrical energy with photovoltaic cells, noting Si and GaAs cells power efficiencies improvement compared to operation in sunlight
p0040 A73-14210

Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency
p0041 A73-14213

Isotope Brayton electric power system for the 500 to 2500 watt range.
p0184 A73-22793

Radiophotovoltaic devices power and energy conversion efficiency limits, investigating phosphors deterioration and nuclide layer optimal thickness
p0185 A73-23280

Optimizing power efficiency of hydrazine-oxygen fuel cells.
p0187 A73-29598

NaK-nitrogen liquid metal MHD converter tests at 30 kW.
p0188 A73-38311

High power density hydrazine-oxygen fuel cell, discussing cell polarization, critical resistance losses and efficiency
p0188 A73-38398

Development of a lightweight body-mounted solar cell array with a high power to weight ratio.
p0046 A73-38408

Effectiveness of enriching air with oxygen in installations with MHD generators
[SM-74/201] p0211 N69-13327

Six converter solar thermionic generator
[NASA-CR-98712] p0052 N69-14920

- Satellite power system configurations for maximum utilization of power
[NASA-CR-100038] p0053 N69-18748
- Solar power conversion subsystems with load capability range from 200 to 500 W considered for advanced Nimbus missions
[NASA-CR-100529] p0053 N69-22175
- Oxygen sensing and recombination electrodes tested for fuel cell application
[NASA-CR-100813] p0265 N69-24894
- Computer program developed to determine charged-particle irradiation effect on single solar cell power output
[NASA-TM-X-63559] p0054 N69-27843
- Critical fuel loading, core hot-spot power generation, and detailed fission rate measurement of critical or subcritical reactors
p0088 N70-14123
- EQUICORE - space dependent code written in FORTRAN 4 assessing nuclear and thermal performance in reactors
[TRG-1808] p0230 N70-22307
- Comparative performance analysis of linear MPD generators
[TUBIK-15] p0234 N70-32771
- Efficiency of power production in MHD generators with nonequilibrium plasmas
[IAE-1791] p0235 N70-33216
- Preliminary design, fabrication, and test of lightweight solar panel of built-up beryllium structure with 29 sq ft active cell area
[NASA-CR-117349] p0061 N71-20727
- Energy storage and release capabilities of superconductors at high power
[NASA-TT-F-13585] p0266 N71-23515
- Development of isotopic power fuels for use at temperatures up to 2000 C
[ORNL-4750] p0100 N72-24703
- Loss rate and capital costs of storing energy in superconducting coils
[DLR-FB-72-10] p0267 N72-26656
- Optimization of specific power highly efficient radioisotope thermoelectric generator
p0251 N73-16636
- POWER LIMITERS**
- Incore thermionic cell power output limitation and thermal/electrical data determination at steady state operation, considering temperature distribution
p0172 A71-25894
- POWER PLANTS**
- Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology
p0036 A71-31671
- Satellite solar power stations, considering energy conversion, microwave generators and beam transfer to earth
p0036 A72-11770
- Design of fuel cells, hydrogen generator, power plant for indirect hydrocarbon-air systems
[PWA-3211] p0200 N68-20884
- Mathematical model for thermodynamic efficiency of combined power plants incorporating magnetohydrodynamic generators
[AD-753031] p0252 N73-18090
- Steel construction design parameters for building and operating ZYKLOW type wind driven power plants
[NASA-TT-F-14872] p0106 N73-21253
- Design and cost estimate of high altitude wind power plant
[NASA-TT-F-14903] p0107 N73-23011
- POWER REACTORS**
- Power production based on controlled fusion of deuterium and tritium nuclei, noting use of magnetic bottle for plasma confinement
p0131 A68-32685
- POWER SPECTRA**
- Signal analysis and power spectral density of fluctuations in series connected open cycle MHD generators
[AD-721454] p0242 N71-28680
- POWER SUPPLIES**
- Power sources - U.S. Army Conference, Atlantic City, May 1968
p0262 A69-23990
- Gas tight lead storage battery with negative plates for oxygen absorption
p0262 A70-46352
- Batteries and fuel cells as portable and transportable electrochemical power sources
p0171 A70-46399
- Power sources - Conference, Atlantic City, May 1970
p0007 A71-13026
- Quasi-vacuum mode thermionic converter for space and remote terrestrial power supplies, describing computer codes for design optimization
p0172 A71-25899
- Electrical subsystem of 2-15 kW Brayton power conversion system consisting of speed controller, alternator voltage regulator, DC power supply, etc
p0175 A71-38910
- Series inverter silicon controlled rectifier 2800 watt dc power supply, noting high efficiency, low weight and stable voltage regulation
p0176 A72-11064
- Optimized 100 We multicell thermionic power supply design with high reliability, noting isomote converter performance characteristics
p0180 A72-34583
- A system for the evaluation of solar cell samples.
p0042 A73-22438
- Development of a plutonium-fueled miniature power supply based on thermionic conversion.
p0186 A73-26028
- Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings.
p0187 A73-29581
- Megawatt fuel cells for aerospace applications.
p0045 A73-29597
- Fuel cell-battery hybrid power source for electric vehicular propulsion
[AD-662234] p0194 N68-15712
- Cobalt oxide and cobalt oxide-magnesium oxide solutions for cobalt isotope power and heat source
[DP-1192-1] p0086 N69-31541
- Projected future world energy requirements, resources, and need for breeder and fusion reactors
[REPT-69-11] p0013 N69-35574
- Molten carbonate fuel cell and molten electrolyte battery for electrically and thermally efficient power source with fast transient response
[AD-692538] p0226 N70-10447
- Power sources for long economic life communication equipment
[AD-693847] p0227 N70-13293
- Operational properties and capabilities of spacecraft power sources for guidance and control
p0231 N70-22862
- Comparison of Brayton cycle power plant and fuel cell for underwater vehicles
[AD-709387] p0238 N70-42951
- Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system
[NASA-CR-119945] p0062 N71-36441
- Characteristics and application of high temperature fuel cells as power sources
[AD-727497] p0244 N71-37624
- Design and development of 1.5 kilowatt fuel cell powerplant for field use
[AD-730796] p0246 N72-14040
- Design of low cost terrestrial photovoltaic power system using solar array
[NASA-CR-127031] p0064 N72-26034
- Use of Cm-244 as radioisotope power fuel in electric power conversion systems
[CONF-720519-1] p0103 N73-12717
- Fuel cell applications as power supplies for rail transportation
[AD-747512] p0250 N73-13956
- Conversion of solar energy to pollution free power
p0019 N73-13870
- Design of repetitively pulsed inductive energy storage systems
[AD-755359] p0267 N73-23014
- Weight optimization for energy storage, coil, cryogen, and dewar
[AD-755360] p0267 N73-26054

POWER SUPPLY CIRCUITS

- Single cell batteries with low input voltage conversion regulation considered as long life energy storage system, noting circuit integration [AD-662770] p0138 A68-42571
- Portable 560-watt thermoelectric power module [AD-662770] p0193 M68-15230
- Design and performance data of power subsystem in flight spacecraft Lunar Orbiter 3 [NASA-CR-100700] p0054 M69-29374
- Brayton cycle power system using dc power supply for space applications [NASA-CR-72529] p0236 N70-36860
- Conceptual design of 5 kW radioisotope-fueled power system for terrestrial applications p0238 N71-11062

POWER TRANSMISSION

- Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems p0035 A71-28666
- Hydrostatic power transmission systems classifications, considering transformation, transport and accumulation of energies /mass, heat, optical, chemical, pneumatic, hydraulic, etc/ p0257 A71-36202
- Pollution free electrical power generation from solar energy, discussing microwave transmission to earth, power shortages, thermal pollution and solar cell manufacture cost [ASME PAPER 71-WA/SOL-2] p0036 A72-15892
- Laser beam power transmission to lunar bases or spacecraft from nuclear fueled satellite power station, discussing achievable ranges and efficiencies p0257 A72-35328
- Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations p0183 A73-20396
- Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams p0043 A73-22791
- Satellite electric power station for conversion of solar energy to microwaves beamed to earth, discussing structural design, flight control, transportation and technology assessment p0044 A73-24554
- The Satellite Nuclear Power Station - An option for future power generation. p0189 A73-38412

PRECAMBRIAN PERIOD

- Utilization of ERTS-1 imagery for mapping large scale structural lineaments in Precambrian Shield and basins containing younger sediments and for mineral and petroleum exploration. [E73-10004] p0104 N73-15340
- Commercial utility of ERTS-1 imagery in structural reconnaissance of Precambrian Shield for minerals and petroleum p0107 N73-23414

PREDICTIONS

- Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000 [NLL-TRANS-1166-(9022.9)] p0096 N71-35501

PRESSURE DISTRIBUTION

- Jet propulsion optimization by energy and energy for minimum total cost flux by varying unit compressor pressure ratio p0008 A71-21300

PRESSURE EFFECTS

- High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature p0172 A71-24218
- Combustion products thermodynamic parameters for natural gas burning in oxygen atmosphere, plotting gas temperature and flow rates against pressure and excess oxidant ratio p0075 A72-29451
- Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air p0080 N68-19175

- Pressure effects on filtration and permeability of heat carriers in earth core rocks p0090 N70-16589

PRESSURE GRADIENTS

- One wavelength MHD induction generator, discussing field pressure gradients, fluid velocities, excitation and electrical output power p0169 A70-40015

PRESSURE MEASUREMENTS

- Integral characteristics of MHD generator with diverging electrodes [AD-694396] p0227 N70-13251

PRESSURE REDUCTION

- Frictional pressure loss measurements in horizontal pipelines for coal/water transport p0092 N70-29067

PRESSURE VESSEL DESIGN

- Petroleum mechanical engineering and pressure vessels and piping - ASME Conference, Denver, September 1970 p0262 A71-14767

PRESSURE WELDING

- Developments in vacuum diffusion welding methods and metallurgical applications of solar energy [NLL-M-22830-(5828.4F)] p0067 N73-20584

PRESSURIZED WATER REACTORS

- Cost analyses for thermal-hydraulic, physics, and fuel-cycle economics of pressurized water reactors using annular metal pins as fuel [ORNL-TM-2493] p0088 N70-12423
- Metallic uranium fueled pressurized water reactors for production of process heat or electric power [ORNL-TM-2451] p0232 N70-25646

PRIMARY BATTERIES

- Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. p0187 A73-29581

PROBABILITY THEORY

- German monograph on thermionic power supply equipment converter network reliability covering I-V characteristics and failure probability calculation p0177 A72-15696

PROBLEM SOLVING

- Conversion and utilization of solar energy to solve energy shortages and pollution problems on earth p0066 N73-13866

PROCEEDINGS

- Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics p0084 N69-30776

PRODUCT DEVELOPMENT

- Commercial thermoelectric generator design, applications and economics compared to batteries and small MG sets p0165 A70-25033
- High electric power output Si solar cell development, discussing increased energy conversion efficiency p0038 A72-28026
- Increased thermal efficiency and increased Diesel engine size economics [REPT.-1] p0081 N68-24990
- Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs p0087 N69-35240
- Preliminary design, fabrication, and test of lightweight solar panel of built-up beryllium structure with 29 sq ft active cell area [NASA-CR-117349] p0061 N71-20727
- Magnetohydrodynamic generator development and applications in radiating power plants, propellant-cooled propulsion systems, and industry p0243 N71-33661
- Production, purification, and conditioning of Ac-227 and development of isotopic heat source fueled with Ac-203 [A/COMP-49/P/287] p0098 N72-16196
- Conceptual design, component assembly, feasibility tests, and evaluation of advanced fuel cell technology [NASA-CR-115572] p0247 N72-23053
- Low temperature research for low cost improvement of acid fuel cell stacks [AD-744806] p0249 N72-33068

- Theoretical and parametric study of inductive magnetohydrodynamic converters including design of cryogenic experimental 4 kW converter [DLR-FB-71-74] p0251 N73-15757
- Bibliography of research projects on heat pipe, development, performance, and application - January through March, 1972 [NASA-CR-135956] p0258 N73-33901
- Bibliography of heat pipe research and development projects conducted during April through June 1972 [NASA-CR-135955] p0259 N73-33902
- Bibliography of heat pipe research and development projects conducted during July through September, 1972 [NASA-CR-135952] p0259 N73-33903
- Supplemental report and bibliographies of heat pipe research projects conducted during calendar year 1971 [NASA-CR-135951] p0259 N73-33904
- PRODUCTION ENGINEERING**
- Cadmium telluride photocells, discussing performance and mass production p0167 A70-38481
- Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology p0036 A71-31671
- Study, cost, and systems analysis of present and projected liquid hydrogen production [NASA-CR-73226] p0011 N68-28227
- Fabrication feasibility and structural design of solar generators with array deployment and retraction capability [NASA-CR-97208] p0052 N68-36630
- Cost analysis and engineering processes for civilian nuclear power production p0087 N69-37567
- Cost estimates for nuclear energy and heat use in various industrial plant processes p0013 N70-14504
- Low cost nuclear energy for production of electrolytic ammonia p0117 N70-14512
- Analysis of solar cell array systems for cost effectiveness in production and design [NASA-CR-109527] p0057 N70-25500
- Design and fabrication of wraparound contact silicon solar cells [NASA-CR-121003] p0067 N73-20044
- Production cost optimization for thermoelectric solar cell [AD-759812] p0068 N73-25104
- Technologies for production and utilization of petroleum, natural gas, oil shale and coal [BM-IC-8612] p0111 N73-30335
- PROJECT MANAGEMENT**
- Conceptual design, component assembly, feasibility tests, and evaluation of advanced fuel cell technology [NASA-CR-115572] p0247 N72-23053
- Applicability of NASA contract quality management and failure mode effect analysis procedures to USGS Outer Continental Shelf oil and gas lease management program [NASA-TM-X-2567] p0100 N72-25955
- PROJECTIVE GEOMETRY**
- Solar paddle configuration for large astronomical satellite and available power [ESRO-TM-P-5/ESTEC/1] p0052 N69-15891
- PROPANE**
- LPG use in fuel cells, discussing efficiency, weight and size p0073 A70-36657
- PROPELLANT COMBUSTION**
- Abstracts of conference papers on kinetics of energy conversion [AD-712738] p0238 N71-12372
- PROPELLANT EVAPORATION**
- Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films. [NSCI PAPER 72-27] p0075 A73-16687
- PROPELLERS**
- Design, development, and performance tests of wind driven, propeller operated electric generation station [NASA-TT-F-15037] p0110 N73-29004
- Development and construction of wind driven electric power generators for specific European areas [NASA-TT-F-15050] p0111 N73-29009
- PROPULSION SYSTEM CONFIGURATIONS**
- Civil aircraft future propulsion requirements, considering larger engine sizes, higher takeoff thrusts and lower noise levels [CASI PAPER 72/10] p0174 A71-37600
- Air breathing hypersonic aircraft technology developments in propulsion systems and structures with emphasis on use of hydrogen fuel [AIAA PAPER 73-58] p0009 A73-17631
- Advanced propulsion system effect on future rotary wing aircraft design p0218 N69-23996
- Helicopter propulsion systems using closed cycle working fluid p0218 N69-23998
- Magnetohydrodynamic generator development and applications in radiating power plants, propellant-cooled propulsion systems, and industry p0243 N71-33661
- Feasibility of using flywheel or flywheel-hybrid propulsion systems on automobiles and buses for air pollution reduction [PB-200143] p0266 N72-11410
- PROPULSION SYSTEM PERFORMANCE**
- Air transport propulsion systems, discussing aircraft operating economics with reference to weight, size, powerplant efficiency, noise and air pollution p0008 A71-27542
- Civil aircraft future propulsion requirements, considering larger engine sizes, higher takeoff thrusts and lower noise levels [CASI PAPER 72/10] p0174 A71-37600
- Soviet civil gas turbine engines construction and performance, noting relatively high specific fuel consumption p0178 A72-21275
- Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft. p0009 A73-22830
- Potential of hydrogen fuel for future air transportation systems. [ASME PAPER 73-ICT-104] p0010 A73-43499
- Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines [PB-200144] p0097 N72-10830
- Fuel related problems in aircraft fuel systems, emphasizing hydrogen treated fuel p0097 N72-11677
- PROTECTIVE CLOTHING**
- Thermoelectric and ventilating system designs for use in protective military clothing [AD-737720] p0247 N72-24139
- PROTECTIVE COATINGS**
- Technical reference manual for protective interior liners of petroleum fuel containers [AD-666969] p0263 N68-23614
- PROTEINS**
- Literature survey on properties of microbiological synthesis of protein substances from petroleum hydrocarbons [JPRS-48150] p0084 N69-29789
- PROTON DAMAGE**
- Computer program developed to determine charged-particle irradiation effect on single solar cell power output [NASA-TM-X-63559] p0054 N69-27843
- PROTONS**
- Fuel cells with solid membranes with ion conductivity, discussing proton electrolyte p0156 A69-32424
- Energy requirements for proton production by electron impact of hydrogen plasma [NASA-TM-X-52344] p0116 N68-24657
- PROTOTYPES**
- Design criteria for integrated lightweight flexible silicon solar cell arrays [NASA-CR-106379] p0056 N69-40952
- Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system [NASA-CR-119945] p0062 N71-36441

- Design of prototype thermal battery incorporating pelletized alkaline heat source
[SC-RR-69-497-A] p0267 N73-21084
- PULSE GENERATORS**
Pulsed power - A new technology for controlled thermonuclear fusion.
p0181 A72-36332
- Application of explosive driven magnetohydrodynamics for producing pulses at multimegajoule levels
[AD-735660] p0247 N72-21497
- PULSED LASERS**
High power giant pulse YAG laser using nonlinear material to achieve complete second harmonic conversion in intracavity experiment
p0163 A70-16470
- Pulsed laser produced high temperature plasma for electric power generation by controlled nuclear fusion, discussing gas dynamic model
p0181 A72-43723
- Review of controlled fusion research using laser heating.
[AIAA PAPER 73-258] p0183 A73-17567
- PURIFICATION**
Fluoride volatility processes for chemical separation and purification of plutonium from waste materials
[RFP-1048] p0080 N68-19265
- PYROLYSIS**
Radioisotopes to provide thermal energy for vacuum distillation and vacuum distillation-vapor pyrolysis in life support systems
[AMRL-TR-67-158] p0080 N68-21041
- PYROMETALLURGY**
Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-4243.P] p0085 N69-31119

Q

- Q SWITCHED LASERS**
Remote airborne laser fluorosensor for sensing environmental pollution and hydrology
[UTIAS-175] p0099 N72-20479
- QUALITATIVE ANALYSIS**
Qualitative analysis of MHD energy conversion efficiency
p0186 A73-27321
- QUALITY CONTROL**
Methods for the quality control of the reflecting surfaces of solar energy condensers /Survey/
p0040 A72-43187
- Manufacturing and qualification testing of solar conversion power supply subsystem for Nimbus 4
[NASA-CR-106009] p0055 N69-38442
- QUANTITATIVE ANALYSIS**
Hydration method for determination of sulfur in petroleum
[NSTIC/13106/67] p0079 N68-15630
- Titration method for uranium concentration analysis in solutions of irradiated fuel reprocessing plants
[CNEA-192] p0079 N68-17192
- QUENCHING**
Semiconductor solar energy converter, deriving conditions for occurrence of photoconductivity quenching
p0034 A70-46325

R

- RADAR EQUIPMENT**
Remote sensing of oil slicks by radar
[AD-709982] p0258 N70-42226
- RADAR IMAGERY**
Detection and monitoring of oil slicks on sea surface using four frequency radar system
p0097 N72-12311
- RADIANT COOLING**
Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation
p0039 A72-35509
- RADIANT FLUX DENSITY**
Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799

- Current-voltage characteristics of cascaded solar thermoelectric generator, determining optimum hot junction temperature as function of radiation concentration
p0030 A70-10752

RADIANT HEATING

- Thermionic generator space power system using solar energy thermionic /SET/ diode array and incandescent radioisotope fuel block radiant heat source
p0128 A68-24803
- Technical and economic feasibility of solar powered space heating, air conditioning, and hot water heating systems for residential applications
[NASA-CR-124063] p0066 N73-17911

RADIATION DETECTORS

- GaAs photoelectric devices for radiation detection and light to electric energy conversion, considering photoresistors, photodiodes and solar cells
p0026 A69-27465

RADIATION DISTRIBUTION

- Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799
- Environmental radiation and concentration levels of atomic gaseous diffusion plant
[GAT-553] p0010 N68-25106

RADIATION EFFECTS

- Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941
- Radiation effects on Cs thermionic converter, discussing radiation interaction with alkaline atoms to complete space charge neutralization by supplementary ion creation
p0026 A69-29261

- Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799
- Si solar cell efficiency in synchronous orbit radiation field increase via improvement in diffusion profile, low resistivity material and diode characteristics
p0039 A72-32131

- Radiation damage and temperature dependence data on silicon solar cell arrays
p0050 N68-28741

- Radiation damage on silicon solar cells - development of cadmium telluride and cadmium sulfide cells
p0055 N69-35592

- Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants
[JPBS-53174] p0016 N71-26623

RADIATION HAZARDS

- Environmental radiation and concentration levels of atomic gaseous diffusion plant
[GAT-553] p0010 N68-25106
- Hazard evaluation for deuterium tritium fusion reactor power plant
[ORNL-TM-2822] p0015 N70-37097

RADIATION PRESSURE

- Potential distribution in channel of liquid metal conduction MHD machine, examining electromagnetic channel pressure
p0130 A68-29187

RADIATION PYROMETERS

- Temperature measurement of products in solar furnace by IR pyrometers, considering interference filters, reflections parasitic effects, etc
p0032 A70-32424

RADIATION SHIELDING

- Aerospace radioisotope power systems, discussing heat source technology, shielding, safety and thermoelectric integration
[SAE AIR 1213] p0176 A72-19387
- Optimal shielding criteria for nuclear apparatus onboard spacecraft
p0224 N69-38756

- RADIATION SOURCES**
Radioactive isotopes as sources of heat and radiation with applications for spacecraft power and propulsion and terrestrial uses in SNAP
p0082 N68-30262
- RADIATIVE HEAT TRANSFER**
Effectiveness analysis of thermal control system for HEAC
p0057 N70-22907
- RADIATIVE TRANSFER**
An analysis of linear focused collectors for solar power.
p0046 A73-38409
- RADIO BEACONS**
Autonomous hydrogen/air fuel cell for long-life missions.
p0184 A73-22752
- RADIO FREQUENCIES**
Plasma heating by fast hydromagnetic wave, measurements of diamagnetic pressure determine efficiency for RF power conversion into thermal energy
p0122 A68-19482
MHD power generator using nonequilibrium plasma generated by inductively coupled RF electric fields, noting plasma diagnostic techniques
p0133 A68-41161
- RADIO METEOROLOGY**
Thermoelectric generation of isotopic electric power for radio meteorological stations
p0201 N68-21974
- RADIOACTIVE CONTAMINANTS**
Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology atomic energy industry
[TID-24193]
p0012 N69-17184
Radioactive dust in air at KVP operation from fission production of fuels and activated aerosols
[KURRI-TR-56]
p0091 N70-21010
- RADIOACTIVE DECAY**
Th 228 decay from short and long term simulation tests of thorium dioxide heat source in thermionic energy converter with W capsule
p0075 A72-36162
Radon daughter equilibrium measurements in uranium mine atmospheres
p0088 N70-14317
- RADIOACTIVE ISOTOPES**
Primary isotope thermionic electric power module design, considering various assemblies
p0155 A69-29190
SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times
p0155 A69-29191
Thermal steady state characterization of isotope radioisotope thermoelectric generator, discussing design features and heat transfer models for operating temperatures and output performance
[ASME PAPER 69-WA/ENER-12]
p0163 A70-14897
Radioisotopes as energy source for power conversion systems, discussing future availability of fission products and transuranium elements from commercial nuclear power reactors
p0074 A71-38948
Radiovoltaic generator energy conversion by thin film solar cells, noting performance dependence on semiconductor band gap and radioisotope characteristics
p0038 A72-28021
Design point characteristics of a 500 - 2500 watt isotope-Brayton power system.
[AIAA PAPER 72-1059]
p0182 A73-13388
Isotope Brayton electric power system for the 500 to 2500 watt range.
p0184 A73-22793
Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range.
p0189 A73-38414
Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427
- Fuel capsule vent system development for the Viking radioisotope thermoelectric generator.
p0077 A73-40766
Deep sea radioisotope fueled thermoelectric generator power supply system design
[MMH-3691-20]
p0191 N68-11382
Reactor shielding, reactor fuel temperatures, and radioisotope sources for dynamic energy conversion systems
p0195 N68-17794
Radioisotopes to provide thermal energy for vacuum distillation and vacuum distillation-vapor pyrolysis in life support systems
[AMRL-TR-67-158]
p0080 N68-21041
Thermoelectric generation of isotopic electric power for radio meteorological stations
p0201 N68-21974
Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics
p0084 N69-30776
Thermoelectric, thermionic, and Brayton conversion devices for radioisotopic power generators
[AD-687131]
p0223 N69-32804
Heat transfer from radioisotope capsules buried in porous materials
[AD-691213]
p0225 N69-40031
Isotopic energy sources for space applications
p0226 N70-11304
Heat transfer problems of earth buried space radioisotope heat sources
[SORIN-T/601]
p0091 N70-21969
Conceptual designs for radioisotope electric power system
[ORNL-TM-2366]
p0233 N70-29364
Isotopic electricity generator studies, including radioactive isotopes, output wattage, generator lifetime, energy conversion, and generator weight
[ORNL-TM-2485]
p0244 N71-37044
Thermally cascaded thermoelectric generator with radioisotopic heat source
[NASA-CASE-NPO-10753]
p0247 N72-26031
- RADIOACTIVE MATERIALS**
Thermoelectric conversion of energy and radioisotope generators studied for selection criteria for power sources
p0119 A68-14136
Fuel cells utilizing direct electrochemical conversion of energy of radioactive elements
p0142 A69-21054
Leak testing of containers and capsules for radioactive materials
[NLI-RISLEY-TRANS-1865-/9091.9P]
p0091 N70-20349
- RADIOACTIVE WASTES**
Usefulness of decay rate in radioactive waste stock management
[CEA-R-3731]
p0087 N69-38022
- RADIOACTIVITY**
Aerial detection of Co 60 fueled radioisotope thermoelectric generators
[SC-TM-68-627]
p0013 N69-19492
- RADIOISOTOPE BATTERIES**
Radioisotope power subsystems for space, examining performance, heat source design, power conversion methods and efficiencies
p0119 A68-10231
Thermoelectric conversion of energy and radioisotope generators studied for selection criteria for power sources
p0119 A68-14136
Problems and various processes of direct energy conversion covering thermoelectric, MHD generators, radionuclide batteries, thermionic converters and galvanic cells
p0121 A68-17792
Radioisotope heater as heat source for maintaining silver-zinc battery temperatures in low ambient environment
p0261 A68-25659
SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
p0137 A68-42528
Gisette 5 thermoelectric radioisotopic generator for submarine use, discussing strontium 90 as isotopic source
p0072 A69-38458

Radioisotope thermoelectric generators /RTG/
design and performance analysis method applied
to generators using Si-Ge Air-Vac type
thermocouples p0161 A69-42260

Long life performance predictions for lead
telluride and silicon germanium radioisotope
thermoelectric generators for deep space missions
p0175 A71-38925

Multihundred watt radioisotope thermoelectric
generator for spacecraft power supply,
discussing system design, performance and safety
requirements p0176 A71-38927

Aerospace radioisotope power systems, discussing
heat source technology, shielding, safety and
thermoelectric integration [SAE AIR 12131] p0176 A72-10387

Unitized bellow radioisotope thermoelectric
generator concept for long term stability, using
standardized design, fabrication and qualification
[ASME PAPER 71-WA/BMER-11] p0177 A72-15940

United States Space Nuclear Electric Power Program.
p0181 A72-45179

Thermoelectric radioisotope generators and nuclear
thermoelectronic reactors, noting anaerobic self
contained reliable operation and suitability for
underwater energy sources p0183 A73-22203

Spacecraft nuclear power source optimization,
considering radioisotope and reactor heat
sources, cryogenic cooler cycle types and
spacecraft design p0184 A73-22799

Radioisotopic energy conversion by radiovoltaic
effect, describing titanium-tritium sources and
semiconductor converter p0185 A73-23278

A model of a thermophotovoltaic radionuclide
battery. p0185 A73-23279

TRANSIT radioisotope thermoelectric generator
technology, discussing structural design,
thermal efficiency, performance prediction,
panel configurations and life test data p0186 A73-26034

Improved technology for multiwatt radioisotope
heater units. p0188 A73-36681

Cost-effective radioisotope thermoelectric
generator designs involving Cm-244 and Pu-238
heat sources. p0188 A73-38389

Thermoelectric nuclear batteries fabrication in
milliwatt power range combining bismuth
telluride thermopiles with plutonia fuel capsules
p0188 A73-38410

The multi-hundred watt RTG - Technology background
and flight systems program. p0189 A73-38418

Multihundred watt radioisotope thermoelectric
generator design for on-pad and orbital
conditions, discussing configurations, Pu-238
heat source and operating characteristics
p0189 A73-38419

Curium 244 heat source design for multihundred
watt radioisotope thermoelectric generator with
Si-Ge thermocouples for energy conversion,
noting low cost p0077 A73-38429

High-efficiency converter and battery charger for
an RTG power source. p0190 A73-42906

Parametric analysis of radioisotope cascaded
thermoelectric generators with Si-Ge first stage
and PbTe second stage [NASA-TM-X-15011] p0192 N68-14585

Effective volume power density analysis for
radioisotope power generator with silicon
germanium thermoelectric elements [NASA-TM-X-14531] p0193 N68-14630

Radioactive isotopes as sources of heat and
radiation with applications for spacecraft power
and propulsion and terrestrial uses in SNAP
p0082 N68-30262

Solar and radioisotope Brayton cycle power supplies
[NASA-TM-X-52438] p0051 N68-31096

Heat transfer from radioisotope capsules buried in
porous materials [AD-691213] p0225 N69-40031

Electrical isotopic generator in milliwatt range
[CEA-R-3834] p0225 N69-40586

Solar, chemical, and nuclear energy as space power
system primary energy sources p0056 N70-11303

Conceptual design of 5 kW radioisotope-fueled
power system for terrestrial applications p0238 N71-11062

Optimization of specific power highly efficient
radioisotope thermoelectric generator p0251 N73-16636

RADIOMETERS
Application of radiometric remote sensors for
detecting oil slicks on water surface
[AD-728551] p0098 N72-14402

RADIOPHOSPHORS
Radiophotovoltaic devices power and energy
conversion efficiency limits, investigating
phosphors deterioration and nuclide layer
optical thickness p0185 A73-23280

RADON
Radon daughter equilibrium measurements in uranium
mine atmospheres p0088 N70-14317

RAIL TRANSPORTATION
Fuel cell applications as power supplies for rail
transportation [AD-747512] p0250 N73-13056

RANKINE CYCLE
Thermodynamic comparison of MHD generators using
Brayton and Rankine cycles, showing Rankine
cycle conversion at higher channel Mach numbers
for nonequilibrium ionization p0131 A68-31228

Throttling effect on thermodynamic efficiency of
MHD generator Rankine cycle with various working
fluids p0134 A68-41271

Alkali metal Rankine turbogenerator program for
space power supplies, discussing power plant
design, nuclear reactor, radiator materials, etc
p0139 A68-45718

Thermodynamic comparison of MHD generators using
Brayton and Rankine cycles, showing Rankine
cycle conversion at higher channel Mach numbers
for nonequilibrium ionization p0140 A69-14154

Mercury cesium plasma in crossed electric and
magnetic fields as working fluid of MHD
generators based on Rankine cycle p0143 A69-23458

Organic Rankine cycle system using heat absorption
from turbine exhaust to provide increased
electrical output and to power air conditioning
p0162 A69-42267

Rankine cycle technology concerning high
temperature, refractory alloy and liquid metal
experience, showing applicability to nuclear
Brayton and thermionic power systems p0163 A70-12513

Fluorocarbon fluid Rankine cycle system utilizing
gas turbine exhaust heat for environmental control
[SAE PAPER 700160] p0165 A70-25371

Brayton, Hg, organic-Rankine and potassium-
Rankine dynamic space power systems for use with
nuclear energy sources p0166 A70-29492

Test facility and performance predictions for
Rankine cycle power system components, including
lithium heater, potassium boiler, condenser and
preheater [GESF-451] p0173 A71-32223

Rankine cycle turboelectric nuclear space power
conversion system with liquid K as working
fluid, discussing current technology status
[GESF-623] p0174 A71-33525

Isotope organic Rankine cycle electric power
systems for the 150 to 1500 watt range.
p0189 A73-38414

Comparison of load-bearing conical nonload-bearing
panel heat radiators for potassium Rankine
nuclear power plant [NASA-CR-72307] p0190 N68-10050

- Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems [SAN-679-3] p0191 N68-10967
- Rankine cycle low power turbocompressor for space applications p0196 N68-17799
- Design criteria for Rankine magnetohydrodynamic generators in space applications [NASA-TN-X-52191] p0200 N68-19019
- Conceptual design of 10 MWe nuclear Rankine system nuclear electric space power [UCRL-503821] p0205 N68-30760
- Analytical data for electric power system components in advanced high temperature potassium Rankine nuclear space power systems [CONF-687802-1] p0206 N68-34481
- Space Rankine cycle power systems technology applied to ground-based power systems p0208 N69-12577
- Comparison of Brayton and Rankine cycle magnetohydrodynamic space power generation systems for use with nuclear heat source [NASA-TN-D-52851] p0217 N69-20852
- Rankine cycle system studies for nuclear space power [UCRL-70853] p0218 N69-23173
- Electrothermal instabilities effects on Brayton and Rankine cycle magnetohydrodynamic space power generation systems [NASA-TN-D-54611] p0224 N69-37883
- System analysis of lithium-cooled Rankine cycle nuclear-electric space power unit [NASA-TN-X-1919] p0226 N70-11975
- Investigating technology for developing organic Rankine cycle power conversion system for space operation [SAN-651-118] p0237 N70-37652
- Conceptual design of 5 kW radioisotope-fueled power system for terrestrial applications p0238 N71-11062
- RARE EARTH ALLOYS**
- Electromechanical energy conversion devices using both conventional and rare-earth cobalt permanent magnet materials [AD-756433] p0252 N73-22168
- RARE GASES**
- Inert gas nonequilibrium MHD power generation in shock tube p0140 A69-12425
- MHD conversion experiments using rare gas, considering Typhoon loop, electron heating and correction effects p0144 A69-23475
- Critical Hall parameter indicating instability in alkali-seeded noble gases in nonequilibrium MHD generators [AIAA PAPER 70-40] p0163 A70-18107
- Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties p0169 A70-40012
- Linear nonequilibrium shock tunnel driven supersonic MHD generator operation under large scale power extraction and strong electromagnetic-rare gas interactions p0172 A71-29879
- Thermal-to-electric power conversion efficiency of nonequilibrium MHD generator with Cs seeded noble gases, considering electrode configuration and gas dynamic effects p0179 A72-29356
- Research program to determine bulk properties of plasmas in MFD disk generator driven by high temperature, large mass flow, alkali shock tunnel [AD-694529] p0228 N70-15650
- Large linear, supersonic MHD generator with rare gases [AD-703314] p0234 N70-31999
- Operating characteristics of large nonequilibrium MHD generator with cesium seeded noble gases and heated electrodes [AD-719381] p0241 N71-24680
- Design parameters of noble gas magnetohydrodynamic generator for nuclear power plant [JUL-706-TP] p0242 N71-27918
- Generation of MHD power with cesium seeded inert gas through use of nonequilibrium ionization [NASA-TN-X-67975] p0246 N72-12166
- RATES (PER TIME)**
- Electron screening effects on thermonuclear reactions under high densities [ITF-69-7] p0223 N69-34199
- REACTION CONTROL**
- Proportional-integral control of reactants supply for hydrazine-oxygen fuel cells with pulse controlled solenoids p0177 A72-18290
- REACTION KINETICS**
- Electrochemical and chemical catalysis differences due to applied field and solvent, discussing fuel cell reaction rates enhancement in electrochemical energy conversion [AGARDGRAPH 81] p0261 A68-22542
- Medium temperature fuel cells advantages including improved electrochemical reaction kinetics, water and heat removal p0156 A69-32417
- Book on fuel cells covering types, applications, thermodynamics, chemical reactions, direct electrical generation, etc p0171 A71-11192
- Reactant properties of fuel cells used as chemical energy converters p0198 N68-17821
- Nuclear seeded magnetohydrodynamic plasmas for electron kinetics using helium 3 [AD-690542] p0225 N69-39863
- Abstracts of conference papers on kinetics of energy conversion [AD-712738] p0238 N71-12372
- REACTIVITY**
- Reactivity effects caused by radial power flattening in gas cooled, fast-spectrum reactor [NASA-TN-D-34059] p0080 N68-19925
- Testing association of automotive fuel composition with exhaust reactivity using different engines and gasolines of varied composition [BM-RI-7756] p0109 N73-27542
- REACTOR CORES**
- Thermonic fuel elements for in-core reactor power plant space applications, summarizing operating and environmental requirements and technology development p0076 A73-22819
- Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion p0184 A73-22829
- In-core 100 kWe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base p0186 A73-26026
- Exploratory study of several advanced nuclear-MHD power plant systems p0189 A73-38411
- Cooling systems for fast reactor cores [EURFNR-615] p0086 N69-31655
- Fast breeder reactor core flow characteristics, heat transfer, and fuel cycle costs p0087 N69-35240
- Subassembly test program in Spert 4 capsule driver core for FY 1969 and 1970 [IN-1313] p0088 N70-13396
- Critical fuel loading, core hot-spot power generation, and detailed fission rate measurement of critical or subcritical reactors p0088 N70-14123
- EQUICORE - space dependent code written in FORTRAN 4 assessing nuclear and thermal performance in reactors [TRG-1808] p0230 N70-22307
- Gas core reactors and MHD generator to solve problems of growing demand for electric power without thermal pollution p0243 N71-33664
- REACTOR DESIGN**
- Engineering problems in the design of controlled thermonuclear reactors [AIAA PAPER 73-259] p0182 A73-16980
- Unmanned reactor-thermoelectric systems for applications in the 1970's p0186 A73-26024
- Fuel cycle costs for varying designs of gas cooled fast breeder reactors [GA-8032] p0081 N68-29161

- Conceptual design of 10 MWe nuclear Rankine system nuclear electric space power
[UCRL-50382] p0205 N68-30760
- Phoenix nuclear fuel cycle costs evaluated for use in maritime reactor design
[BNWL-8511] p0082 N69-15543
- Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings
[HATT-659] p0218 N69-23954
- Fast breeder reactor design considerations of blanket cycle efficiency and management
p0086 N69-31987
- Thermonuclear power reactor design using lithium blanket for plasma control and regeneration of tritium fuel consumed in basic reaction
[UCRL-71500] p0226 N70-12638
- Design parameters for molten salt breeder reactor
[WASH-1037] p0090 N70-19219
- Fuel depletion and sodium void coefficients, and economic evaluation of sodium cooled fast nuclear reactor
p0230 N70-22218
- High temperature reactor design
[TRG-1996] p0093 N70-37284
- ROD, nuclear and fuel-cycle analysis code, for circulating fuel reactors and optimizing core design
[ORNL-TM-3359] p0098 N72-17737
- Cost analysis and design of possible fusion reactor coil systems
[UCRL-73187] p0019 N73-12741
- REACTOR MATERIALS**
Japanese nuclear fuels and reactor materials technology
[LLB/TRANS-240] p0093 N70-33032
- REACTOR PHYSICS**
Packed bed catalytic reactors cooling capacity in promoting endothermic reactions of hydrocarbon fuels, using computerized temperature and composition profiles
[AIAA PAPER 69-588] p0072 A69-33265
- REACTOR SAFETY**
Nuclear surface effect vehicle and subsonic aircraft for transoceanic cargo shipping, discussing mobile reactor safety tests under high speed impact conditions
[AIAA PAPER 70-1221] p0008 A71-22779
- Continuous testing of environment at Marcoule chemical plant for irradiated fuel treatment
[NLL-RISLEY-TRANS-1866-/9091.9P] p0091 N70-20596
- REACTOR TECHNOLOGY**
Closed cycle plasma MHD systems, discussing nonequilibrium ionization, reactor economics, performance and requirements
p0126 A68-22960
- Fusion energy technology, discussing controlled reactor construction and operation
p0171 A71-20000
- AEC/NASA thermionic reactor program with emphasis on technology utilization, comparing with French, German and Soviet programs
p0184 A73-22815
- Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829
- The Satellite Nuclear Power Station - An option for future power generation.
p0189 A73-38412
- Nuclear fuel requirements and costs of reactors in Germany /supplement/
[KFK-466] p0081 N68-22608
- Results from USAEC plutonium utilization programs conducted by Battelle-Northwest
[BNWL-SA-2065] p0082 N69-15237
- Operation, research, and maintenance of gas coolant loops of Peqase nuclear fuel testing reactor
[CEA-R-3564] p0221 N69-27494
- Utility needs and reliability of operational fast breeder reactors
p0087 N69-35243
- Cost analyses for thermal-hydraulic, physics, and fuel-cycle economics of pressurized water reactors using annular metal pins as fuel
[ORNL-TM-2493] p0088 N70-12423
- Experimental studies in nuclear chemistry and thermochemistry for improved reactor fuels
[ANL-7575] p0090 N70-19586
- Research in Japan for developing fast reactor mixed oxide nuclear fuels
[NLL-DOONRE-TRANS-419-/9091.9P/] p0091 N70-21080
- Failure data handbook for nuclear power facilities - failure category identification and glossary
[LNEC-REMO-69-7-VOL-2] p0234 N70-31812
- Modular design of out-of-core nuclear thermionic power conversion system
[NASA-TN-X-68049] p0247 N72-23675
- RECLAMATION**
Remote sensing for coal mined land reclamation
[NASA-CR-124608] p0097 N72-12329
- Detection and monitoring area strip mining and reclamation in Ohio using ERTS-1 imagery
[E72-10284] p0103 N73-13334
- Detection, monitoring, and mapping coal strip mining and reclamation in Ohio from ERTS-1 imagery
[E73-10641] p0107 N73-25338
- EBRF imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337
- SkyLab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337
- Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania
[E73-11112] p0112 N73-33269
- RECOMBINATION REACTIONS**
GaAs solar cells performance as function of doping levels, ascribing poor efficiencies to surface recombinations
p0032 A70-21721
- Oxygen sensing and recombination electrodes tested for fuel cell application
[NASA-CR-100813] p0265 N69-24894
- RECTIFICATION**
Electric power generation on earth via satellite solar power station, assessing technologies of energy collection and conversion, microwave transmission and rectification
p0045 A73-35313
- RECTIFIERS**
Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage
p0164 A70-21274
- Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth
p0035 A71-28671
- REENTRY EFFECTS**
Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427
- REENTRY VEHICLES**
Plutonium isotope reentry vehicle experimental design study
[NASA-CR-72366] p0081 N68-25283
- Preliminary design and performance considerations for 25 kW Pu 238 heat source Isotope Reentry Vehicle
[NASA-CR-72555] p0223 N69-34989
- REFINING**
Soviet Bloc research on petroleum refining and additive properties
[AD-700689] p0093 N70-35477
- Catalytic and thermal reforming of gaseous hydrocarbons with steam into town gas
[NASA-TT-P-13668] p0095 N71-28159
- REFLECTANCE**
Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799
- Solar absorptances and spectral reflectances of metals
[NASA-TN-D-5353] p0055 N69-31895

REFRACTORY MATERIALS

- Materials and cooling of aircraft gas turbine engines noting nickel and tantalum alloys, turbine inlet temperatures, coatings, etc
p0122 A68-19791
- Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect
p0162 A70-10754
- Development and evaluation of oxide electrode materials for use with open cycle magnetohydrodynamic generator
p0243 N71-35627

REFRACTORY METALS

- High temperature and vacuum solar furnace processing of refractory metals in space or on moon
p0039 A72-37675

REFRIGERATING MACHINERY

- Theoretical analysis and experimental verification of two phase heat transfer characteristics of combined solar collector-ammonia generator for solar air conditioner
p0053 N69-17227

REFUELING

- Automatic controlled pressure system for onshore fueling of navy aircraft
[AD-748211]
p0267 N73-13997

REGENERATION

- Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities
[JPRS-46752]
p0208 N69-11943

REGENERATIVE COOLING

- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant
[AIAA PAPER 68-1091]
p0072 A68-44975
- Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant
[AIAA PAPER 68-1091]
p0115 A69-43725
- Spacecraft dynamic solar electric power/thermal control system with cold liquid flow and regenerator cooling for energy conversion efficiency and weight characteristics improvements
p0043 A73-22785

REGENERATIVE FUEL CELLS

- Thermally regenerative energy conversion system using galvanic cells with electrochemically combined sodium and mercury streams to produce alloy and energy
p0129 A68-27639
- Chemically regenerative fuel cells, discussing competitiveness with direct fuel cells
p0129 A68-27650
- Thermally regenerative Li-Sn cell with immobilized fused salt electrolyte, discussing current density-voltage curves for various operating conditions
p0137 A68-42517
- Electrothermal and thermal modes of regeneration in fuel cells for space power applications
p0199 N68-17825
- Energy conversion efficiency of thermal and electric regenerative fuel cells
p0203 N68-28735

REGENERATORS

- Liquid metal regenerator design and test evaluation for gas turbine engine fuel consumption improvement
[ASME PAPER 72-GT-33]
p0178 A72-25629
- Development of regenerator for use as Brayton cycle space power system using solar energy
[NASA-CR-108945]
p0057 N70-20627

REGULATIONS

- Senate hearings on establishment of Commission on Fuels and Energy
p0096 N71-30165
- Proceedings of conference on licensing and control of nuclear power plants
[IAEA-SM-146/5]
p0017 N71-35176

RELATIVISTIC PARTICLES

- Pulsed power - A new technology for controlled thermonuclear fusion.
p0181 A72-36332

RELIABILITY

- Silicon solar cell fabrication technology developments for long mission life performance reliability over wide temperature and radiation intensity ranges
p0038 A72-28029
- Autonomous hydrogen/air fuel cell for long-life missions.
p0184 A73-22752
- Reliability optimization of automatic coal mining equipment
[NASA-TM-X-61123]
p0081 N68-25716
- Systems analysis of modular energy storage unit for improved reliability of battery power system
p0264 N69-12431
- Ultrareliable power processor for hydrocarbon-air fuel cell power systems
[AD-699311]
p0231 N70-23985
- Computer estimates of weight, cost, and reliability of six battery configurations
[NASA-CR-122296]
p0266 N72-11982
- RELIABILITY ANALYSIS**
- Reliability analysis of solar thermoelectric generator module as function of individual photocells, circuit design and redundancy
p0036 A71-31672
- Reliability analysis on petroleum industry requirements
p0100 N72-25986

RELIABILITY ENGINEERING

- Potential in performance improvements in air breathing propulsion related to reliability, maintainability and cost
p0131 A68-33438
- NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects
[AIAA PAPER 71-825]
p0174 A71-34720
- Si solar cell design for high power/weight ratio and extreme environmental operating conditions, describing technological innovations for reliability and efficiency enhancement
p0039 A72-37780
- Superconducting magnetic systems reliability engineering and design, noting combined conductors for uncontrolled transition prevention in normal state under subcritical currents
p0182 A73-10616
- Thermoelectric radioisotope generators and nuclear thermoelectronic reactors, noting anaerobic self contained reliable operation and suitability for underwater energy sources
p0183 A73-22203
- Isotope Brayton electric power system for the 500 to 2500 watt range.
p0184 A73-22793
- Long-life light weight reliable fuel cell development for long term space missions power supplies, describing system components and construction materials
p0044 A73-29596
- Solar conversion power supply subsystem for Nimbus D satellite, and engineering tests
[NASA-CR-103418]
p0055 N69-32305
- Utility needs and reliability of operational fast breeder reactors
p0087 N69-35243
- Reliability analysis of solar generator on ESRO 1 satellite
[NASA-TT-P-10498]
p0065 N73-10051
- Reliability analysis of thermoelectric module solar energy converter
[AD-757087]
p0067 N73-23015
- REMOTE CONTROL**
- Operational properties and capabilities of spacecraft power sources for guidance and control
p0231 N70-22862
- REMOTE SENSORS**
- Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner
p0074 A72-16600
- Thermal mapping at electrical power generating sites for outfall from fossil or nuclear fuel plants, considering airborne application
p0076 A73-33360

SUBJECT INDEX

RESISTORS

Thermal activity of the Uson Caldera based on infrared and photographic aerial survey. p0077 A73-39895

Geologic data acquisition from space-borne photography p0088 N70-14088

Remote sensing of oil slicks by radar [AD-709982] p0258 N70-42226

Remote sensing for coal mined land reclamation [NASA-CR-124608] p0097 N72-12329

Application of radiometric remote sensors for detecting oil slicks on water surface [AD-728551] p0098 N72-14402

Effectiveness of remote sensor techniques for detecting oil films on water surface [AD-728422] p0098 N72-14478

Remote airborne laser fluorosensor for sensing environmental pollution and hydrology [OTIAS-175] p0099 N72-20479

Feasibility of detecting subsurface coal fires in Wyoming and Montana from ground observation, aerial photography, and satellite imagery p0107 N73-22384

REPLENISHMENT
MHD power generation, investigating replenishment of zirconia electrodes from plasma in open flame and duct configurations p0166 A70-30535

REQUIREMENTS
Development and distribution of natural resources to satisfy energy requirements of US industry during the 1970's [BM-IC-85261] p0096 N71-36393

RESEARCH
Developments in various research programs [ANL-7425] p0012 N69-15807
Briefings on energy sources, resources, and research p0018 N72-25929

RESEARCH AND DEVELOPMENT
MHD power plant research and development, discussing shock wave electric power generators and modulated systems p0146 A69-24469

French R and D programs on Si and various thin film photovoltaic solar cells, considering efficiency, reliability, and weight and cost reduction problems p0037 A72-28002

Utility needs and reliability of operational fast breeder reactors p0087 N69-35243

Research in Japan for developing fast reactor mixed oxide nuclear fuels [NLL-DOUNRE-TRANS-419-/9091.9P/1] p0091 N70-21080

Design and component analysis of future magnetohydrodynamic nuclear power plants [JUL-689-TP] p0242 N71-30458

Research and development on silicon solar cell with improved efficiency [NASA-CR-121751] p0062 N71-34042

Indexes for inventory of energy research p0018 N72-25931

Japanese research and development progress in energy conversion and chemical propulsion [AD-739325] p0248 N72-27067

Hearings concerning research and development requirements for future energy needs p0019 N73-10980

Congressional hearings on earthbound potential utilization of solar energy p0066 N73-14812

Energy requirements of Department of Defense and identification of research and development activities [AD-754824] p0106 N73-20819

Congressional hearings on research and development of environmentally safe electric power production p0020 N73-20976

Soviet research and development of solar batteries and power cells for spacecraft [AD-756039] p0067 N73-21973

Congressional study on historical background of energy research and development p0021 N73-22928

RESEARCH FACILITIES

Lewis Research Center applications of optics to research in flight propulsion and space power generation, discussing gas density visualization, radiative heat transfer, etc p0032 A70-23522

Design and construction of AFGX experimental magnetohydrodynamic generator at nuclear research facility Juelich, Germany [JUL-510-TP] p0201 N68-21331

Closed loop facility designed to study MHD generator using argon-caesium working fluid [NASA-TN-D-4867] p0207 N68-37259

Power systems research reviews at Marshall Space Flight Center p0215 N69-18068

Basic and applied research in seismology, research and training facilities, users, and funding [NASA-CR-107020] p0087 N70-12263

Indexes for inventory of energy research p0018 N72-25931

RESEARCH PROJECTS

Energy conversion research [AFCL-67-0512] p0200 N68-21051

Research in electrofluid dynamic energy conversion processes - ion currents, electrostatic charge, plasma dynamics, and direct power generators [AGARDOGRAPH-122] p0215 N69-18439

Physical and chemical energy sources for earth, sea, and space [AD-753828] p0020 N73-18093

Cumulative bibliography of research and development projects conducted on heat pipe technology and applications [NASA-CR-135953] p0258 N73-33900

Bibliography of research projects on heat pipe, development, performance, and application - January through March, 1972 [NASA-CR-135956] p0258 N73-33901

Bibliography of heat pipe research and development projects conducted during April through June 1972 [NASA-CR-135955] p0259 N73-33902

Bibliography of heat pipe research and development projects conducted during July through September, 1972 [NASA-CR-135952] p0259 N73-33903

Supplemental report and bibliographies of heat pipe research projects conducted during calendar year 1971 [NASA-CR-135951] p0259 N73-33904

RESERVES

Analysis of trend in free world atomic power generation, uranium production, resources, and requirements until 1985 [ORNL-TR-1825] p0081 N68-28954

Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000 [NLL-TRANS-1166-(9022.9)] p0096 N71-35501

RESISTANCE HEATING

Conductivity and electron temperature in coaxial MHD generator plasma with magnetic field, studying Joule heating effect on performance p0144 A69-23463

Integral characteristics of MHD generator with diverging electrodes [AD-694396] p0227 N70-13251

MHD energy conversion using Joule heating [AD-720257] p0241 N71-26190

RESISTOJET ENGINES

Hydrogen resistojets design and testing with Be heat exchangers, noting appropriate power efficiency and exhaust velocity for synchronous communication satellites orbital transfer [AIAA PAPER 72-449] p0115 A72-26186

Hydrogen resistojets for primary propulsion of communications satellites. p0009 A73-15741

RESISTORS

Two dimensional analysis of end region of single load crossconnected MHD generator, noting grading resistors use to remove infinite concentrations p0128 A68-25596

Design, manufacture, and testing of parasitic load resistors for Brayton power conversion system [NASA-CR-72436] p0208 N69-10335

RESOURCE ALLOCATION

SUBJECT INDEX

RESOURCE ALLOCATION

Analysis of Usenergy resources and review of national laws and policies which influence energy situation

p0096 N71-35181

Congressional hearings on causes and implications of impending shortages of gasoline, heating oil, diesel fuel, jet fuel, and electricity

p0022 N73-33928

RESOURCES

Analysis of trend in free world atomic power generation, uranium production, resources, and requirements until 1985

p0081 N68-28954

Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics

p0084 N69-30776

Projected future world energy requirements, resources, and need for breeder and fusion reactors

[RPPT-69-111]

p0013 N69-35574

Analysis of Usenergy resources and review of national laws and policies which influence energy situation

p0096 N71-35181

Development and distribution of natural resources to satisfy energy requirements of US industry during the 1970's

[BM-IC-8526]

p0096 N71-36393

RESOURCES MANAGEMENT

Resources management in Ohio utilizing ERTS-1 imagery

[E73-10032]

p0104 N73-15365

Application of ERTS-1 imagery to resource management in Ohio

[PAPER-R3]

p0110 N73-28361

Application of ERTS-1 imagery to resources management and planning in Ohio

[E73-10987]

p0112 N73-31294

RETRACTABLE EQUIPMENT

Fabrication feasibility and structural design of solar generators with array deployment and retraction capability

[NASA-CR-97208]

p0052 N68-36630

Design and performance of roll-up solar array engineering model

p0061 N71-22561

REUSABLE SPACECRAFT

Hypersonic aircraft technology, discussing long range transport, reusable launch vehicles and propulsion systems

p0115 A70-31851

REVIEWING

Historical review of scientific work on photovoltaic effects and on energy conversion devices using this effect

[NASA-CR-92679]

p0047 N68-16882

Review and comparison of energy forecasts for United States of America

[PB-189938]

p0015 N70-37343

REYNOLDS NUMBER

Magnetic Reynolds number effect in synchronous induction striated flow MHD generator

p0120 A68-15423

Induction type liquid metal MHD generators with flat or cylindrical channels at large magnetic Reynolds number, discussing magnetic field equations

p0123 A68-20403

One dimensional plasma flow variables relations analyzed in crossed electric and magnetic fields with small magnetic Reynolds numbers

p0126 A68-23796

MHD generator design with electric conductivity waveform at small magnetic Reynolds numbers

p0156 A69-29911

RIGID STRUCTURES

Traveling transverse magnetic field interaction with rigid conducting spheres or cylinders, discussing electromechanical characteristics and MHD energy conversion applications

p0129 A68-26140

Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies

p0038 A72-28034

Calorimetric evaluation of three 1.5-meter diameter inflatable rigidized solar concentrators for solar dynamic cycle power systems

[NASA-TN-D-5234]

p0054 N69-28123

Storage stable, thermally activated foaming compositions for erecting and rigidizing mechanisms of thin sheet solar collectors

[NASA-CASE-LAR-1C373-1]

p0062 N71-26155

ROCKET ENGINE DESIGN

Design and development of air breathing engine system for space shuttle vehicle

p0017 N71-29607

ROCKS

Geothermal energy extraction from hot rocks via deep dry wells by pressurized water circulation, solving numerically fluid flow, heat transport and rock fracture equations

p0075 A73-16382

Splitting method of investigating strength properties of typical rocks in coal and shale deposits

p0083 N69-21442

Combined nuclear geophysical methods in oil geology for surface rock analysis of moon and planets

[SM-112/25]

p0085 N69-30800

Natural isotopic distribution studies for evaluation of new hydrocarbon deposits

[SM-112/27]

p0085 N69-30801

Filtration of heat carriers in earth core rocks at depths from 6 to 8 kilometers

p0090 N70-16588

Pressure effects on filtration and permeability of heat carriers in earth core rocks

p0090 N70-16589

Dielectric and microwave properties of rocks and minerals

p0097 N72-12262

Aerial 35mm color photography for reconnaissance uranium exploration and soil and rock identification in Wyoming Tertiary basins

p0100 N72-26334

ROOMS

Problems of room heating in summer - suitable building materials

p0059 N70-30560

ROTARY WING AIRCRAFT

Rotary wing aircraft ecological advantages in logging, off shore oil exploration and short haul passenger transport for airport size reduction

p0076 A73-33185

Advanced propulsion system effect on future rotary wing aircraft design

p0218 N69-23996

ROTATING DISKS

Rotating disks, current and potential distribution in cylindrical geometries, foaming electrolyte fuel cell, and iodine cathode

p0223 N69-34813

ROTATING ELECTRICAL MACHINES

Rotating electrical machine superconducting field winding design requirements in terms of size, magnetic energy storage, power level, rotation speed and pole number

p0182 A73-11828

ROTATING GENERATORS

Traveling wave MHD induction generator with variable fluid velocity having rotating machine internal electrical efficiency

[JPL-TR-32-1328]

p0133 A68-39723

Kilowatt rotary dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics

p0178 A72-21414

Geometric properties of paraboloidal whirling membrane solar energy concentrators

[NASA-TN-D-5859]

p0058 N70-29807

ROTATING MIRRORS

Performance of expandable whirling membrane solar energy concentrator

[L-5484]

p0049 N68-27926

ROTORS

Modification of dc motor with magnetically suspended rotor to increase momentum storage capacity

[NASA-CR-115792]

p0266 N71-13514

RURAL AREAS

Geographic applications of ERTS-1 imagery to rural landscape change in Tennessee
[E72-10355] p0103 N73-14343

S

SACRAMENTO VALLEY (CA)

ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California
[E73-10478] p0107 N73-21315
Analysis of ERTS-1 imagery of Northern Coast Ranges and Sacramento Valley, California for locating mercury deposits and oil and gas fields
[PAFER-618] p0109 N73-28249

SAFETY

Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry
[E72-10064] p0102 N72-32336
Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10096] p0105 N73-18321
Application of ERTS-1 imagery to fracture related mine safety hazards in coal mining industry in Indiana and Illinois
[E73-10371] p0105 N73-19366
Application of ERTS-1 imagery to fracture-related mine safety hazards in Ohio coal mining industry
[E73-11034] p0112 N73-31338

SAFETY FACTORS

Social quantitative benefit vs risk assessment of new technologies, considering atomic power safety
p0007 A71-12120
Multihundred watt radioisotope thermoelectric generator for spacecraft power supply, discussing system design, performance and safety requirements
p0176 A71-38927

SAFETY MANAGEMENT

Development of minimum and optimum requirements for environmental surveillance programs around nuclear fuel reprocessing plants
p0095 N71-29878

SAHA EQUATIONS

Generalized Saha equation for nonequilibrium two temperature plasmas
p0197 N68-17813

SALTS

Ultrasonic instrumentation for incipient boiling detection in liquid metals or fused salts
[N70-3622-10] p0190 N68-10758

SANDSTONES

Ultrasonic energy effects on flow rate of crude oil through porous sandstone
p0092 N70-25326

SATELLITE ANTENNAS

Solar cell panel configuration on ELDO launch vehicle
[REPT-RT-68/719] p0057 N70-17439

SATELLITE DESIGN

The feasibility of a satellite solar power station.
p0045 A73-32718

Solar cell panel configuration on ELDO launch vehicle
[REPT-RT-68/719] p0057 N70-17439

SATELLITE OBSERVATION

Satellite monitoring of open pit mining operations
[BM-IC-8530] p0107 N73-24432

SATELLITE POWER TRANSMISSION (TO EARTH)

Feasibility analysis of satellite solar/thermal power generation and transmission to earth, describing Brayton cycle heat engine for initial energy conversion
p0046 A73-38404

SATELLITE SOLAR ENERGY CONVERSION

Electric power generation on earth via satellite solar power station, assessing technologies of energy collection and conversion, microwave transmission and rectification
p0045 A73-35313

Feasibility analysis of satellite solar/thermal power generation and transmission to earth, describing Brayton cycle heat engine for initial energy conversion
p0046 A73-38404

SATELLITE SOLAR POWER STATIONS

Electric power generation on earth via satellite solar power station, assessing technologies of energy collection and conversion, microwave transmission and rectification
p0045 A73-35313

Feasibility analysis of satellite solar/thermal power generation and transmission to earth, describing Brayton cycle heat engine for initial energy conversion
p0046 A73-38404

Feasibility of satellite solar power station technology concepts, discussing cost analysis, energy conversion efficiency, weight, space environment and microwave transmission
p0046 A73-39247

SATELLITE TELEVISION

Incore thermionic reactor application to meet European TV broadcasting satellite and submarine and underwater laboratory power requirements
p0181 A72-36166

SATELLITE TRANSMISSION

Satellite power generation and transmission system for solar energy conversion, noting estimates of surface area and weight of collectors
p0026 A69-12296

Satellite solar power station for solar energy conversion and transmission to earth via microwave beam, discussing technology status and weight and cost projections
p0042 A73-18027

Satellite solar power station systems engineering study, examining basic concept technical and economic feasibility
p0043 A73-22814

Satellite electric power station for conversion of solar energy to microwaves beamed to earth, discussing structural design, flight control, transportation and technology assessment
p0044 A73-24554

The Satellite Nuclear Power Station - An option for future power generation.
p0189 A73-38412

Possible space application of incore thermionic reactor particularly for direct television broadcasting
[BNBW-FB-W-70-16] p0233 N70-30407

SATELLITE-BORNE PHOTOGRAPHY

Gemini space photography applications in petroleum industry, especially for geologists involved in regional mapping or modern environmental research
p0071 A68-30437

Geological mapping of New York State based on ERTS-A imagery
[E72-10020] p0101 N72-29272

Mapping of strip mine areas in southeastern Ohio from ERTS-1 imagery
p0110 N73-28372

SATELLITES

Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth
p0035 A71-28665

Satellite solar power stations, considering energy conversion, microwave generators and beam transfer to earth
p0036 A72-11770

Space electrical power systems capable of meeting mission requirements
[NSSA-R40-68-5] p0206 N68-35232

Satellite power system configurations for maximum utilization of power
[NASA-CR-100038] p0053 N69-18748

SCALE MODELS

Feasibility of 30 watts per pound roll-up solar array - design of engineering demonstration model with deployability of selected flight configuration and thermal cycling tests of array
[NASA-CR-94243] p0048 N68-21879

SCALING LAWS

Large superconducting magnets for MHD power plants, discussing scale-up requirements, cryogenic system, stable operation margin and emergency system shutdown
p0122 A68-20175

SCREEN EFFECT

Electron screening effects on thermonuclear reactions under high densities
[ITF-69-7] p0223 N69-34199

SEA WATER

SUBJECT INDEX

- SEA WATER**
 Oil slick spreading on calm sea due to force of gravity and surface tension of water p0257 N70-10537
 Excitation and fluorescence spectra for identifying Navy fuel and fuel oils in sea water [AD-743703] p0102 N72-33736
- SEAMS (JOINTS)**
 Design of solar energy concentrators with concentric circular seams of plastic films [AD-755829] p0067 N73-21712
- SEDIMENTARY ROCKS**
 The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol. p0076 A73-25465
 Oil exploration in large intercratonic sedimentary basins in Oklahoma using ERTS-1 imagery [E73-10646] p0108 N73-25342
- SEDIMENTS**
 Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio [E72-10259] p0102 N73-12358
 Digital analysis of ERTS-1 data to determine sedimentation levels in Potomac and Anacostia Rivers confluence and strip mining in Allegheny County, Maryland [PAPER-E13] p0110 N73-28277
- SEEBECK EFFECT**
 Thermoelectric generators theory, design and performance characteristics, discussing Seebeck, Peltier and Thomson effects p0180 A72-31375
- SEISMIC WAVES**
 Seismic wave propagation used in prospecting for oil fields and minerals p0080 N68-17607
- SEISMOLOGY**
 Exploratory geology and use of seismology in petroleum industry p0079 N68-17606
 Basic and applied research in seismology, research and training facilities, users, and funding [NASA-CR-107020] p0087 N70-12263
- SELECTIVITY**
 Solar installations optical properties selectivity increase by light-collecting surfaces mechanical treatment, describing plate grinding with abrasive powders p0031 A70-19625
- SELF EXCITATION**
 Induction, helical and straight through liquid metal MHD generators tested under independent and self excitation conditions p0151 A69-27512
- SEMICONDUCTING FILMS**
 CdS thin film solar cell noting advantages over silicon photovoltaic cells for converting light into electric energy p0024 A68-34613
- SEMICONDUCTOR DEVICES**
 Soviet papers on semiconductor solar energy converters covering design and tests for thermoelectric, thermionic and photoelectric units, properties, materials, etc p0029 A70-10750
 Semiconductor solar energy converter, deriving conditions for occurrence of photoconductivity quenching p0034 A70-46325
 Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties p0037 A72-24315
 Principle, production, and efficiency of silicon solar cells for spacecraft power supply [RF-89-0] p0052 N69-11991
 Techniques for large scale solar energy conversion into electrical power [JPRS-48222] p0054 N69-30038
 Thermoelectric materials and semiconductor thermoelements [AD-690786] p0227 N70-13348
- Analysis of semiconductor with two impurity levels to exchanging current carriers to determine conditions for occurrence of photoconductivity quenching [AD-743031] p0064 N72-31083
- SEMICONDUCTOR JUNCTIONS**
 Semiconductor solar thermoelectric generator allowing thermoelement replacement during service including construction, bridging methods and characteristics p0030 A70-10751
 Current-voltage characteristics of cascaded solar thermoelectric generator, determining optimum hot junction temperature as function of radiation concentration p0030 A70-10752
 Collection efficiency and spectral response calculations for semiconductor heterojunction solar cells p0033 A70-40623
 Photoeffect efficiency of solar energy converters based on semiconductor cadmium sulfide-copper sulfide heterojunctions p0036 A71-92536
 Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response p0039 A72-30225
 High-efficiency Ga/1-x/Al/x/As-GaAs solar cells. p0040 A73-10132
 Principles of photovoltaic solar energy conversion. p0044 A73-29591
 Solar cell efficiencies computed for semiconductor heterojunction cells [NASA-CR-49827] p0056 N70-12119
- SEMICONDUCTORS (MATERIALS)**
 High temperature thermoelectric materials limitations in energy conversion systems [AGARDGRAPH 81] p0125 A68-22540
 Book on solar cells U.S. patent literature, discussing Si semiconductors, panel fabrication techniques, photoemissive devices, Cd, Ga and organic compounds, etc p0032 A70-22050
 Thermoelectric cooling devices materials figure of merit upper limits above room temperature, using semiconductors parameters experimental values p0179 A72-27722
 Solar cell graded band gap materials, determining I-V characteristics, junction capacitance and photovoltaic spectral response p0040 A73-14207
 High temperature material limitations in thermoelectric energy conversion p0198 N68-17820
 Conversion efficiency of photovoltaic cells for converting luminous into electrical energy p0199 N68-17829
 Electrical, thermal, and optical properties of semiconductors associated with energy conversion [AD-693235] p0056 N70-11427
 Analysis of semiconductor with two impurity levels to exchanging current carriers to determine conditions for occurrence of photoconductivity quenching [AD-743031] p0064 N72-31083
- SENSORS**
 Oxygen sensing and recombination electrodes tested for fuel cell application [NASA-CR-100813] p0265 N69-24894
- SEPARATED FLOW**
 Electrical losses in MHD generator described from separation of flow system [JUL-742-TP] p0245 N72-11639
- SEPARATORS**
 Thermal cells stressing lithium anode cells with various cathodes in eutectic electrolyte, discussing inorganic separators compatibility p0261 A68-42515
 Acceleration devices for liquid metal magnetohydrodynamic generators [NASA-CR-97885] p0209 N69-13151
- SERT 2 SPACECRAFT**
 Design and performance of SERT 2 spacecraft electrical power system [NASA-TM-X-2234] p0061 N71-20471

SERVICE LIFE

SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times

p0155 A69-29191

Long life performance predictions for lead telluride and silicon germanium radioisotope thermoelectric generators for deep space missions

p0175 A71-38925

Self regenerating molten seed electrodes for open cycle MHD power generators longevity, regulating combustion chamber and gas flow seeding

p0178 A72-18336

Silicon solar cell fabrication technology developments for long mission life performance reliability over wide temperature and radiation intensity ranges

p0038 A72-28029

The phosphoric acid fuel cell, a long life power source for the low to medium wattage range.

p0184 A73-22821

Performance capabilities and cycle life of high specific energy batteries for pollution free electric vehicles

[ANL-7953]

p0267 A73-19061

SERVICE MODULES

Solar conversion power supply subsystem for Nimbus D satellite, and engineering tests

[NASA-CR-103418]

p0055 A69-32305

SERVOMECHANISMS

Modern control techniques applied to energy conservation flight control systems.

p0263 A73-38415

SEWAGE

Low cost energy for sewage water processing and reuse

p0014 A70-14519

SHADOWS

Shadow effects on current-voltage characteristics of solar cell array circuits, developing mathematical models

p0028 A69-35709

SHALES

Minerally entrapped fatty acids analyzed after demineralization liberation of exhaustively extracted oil shale from Green River Formation

p0071 A68-27231

The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.

p0076 A73-25465

17alpha-H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.

p0076 A73-29734

Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1

[EIS-AA-72-5242-D-1-VOL-1]

p0111 A73-29367

Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2

[EIS-AA-72-5242-D-2-VOL-2]

p0021 A73-29368

SHIPS

Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases

[PB-198775]

p0017 A71-32624

SHOCK TUBES

Inert gas nonequilibrium MHD power generation in shock tube

p0140 A69-12425

SHOCK TUNNELS

Noble gas mixture large shock tunnel driven linear MHD generator, examining electron density, operating characteristics and electrical properties

p0169 A70-40012

Linear nonequilibrium shock tunnel driven supersonic MHD generator operation under large scale power extraction and strong electromagnetic- rare gas interactions

p0172 A71-29879

Research program to determine bulk properties of plasmas in MHD disk generator driven by high temperature, large mass flow, alkali shock tunnel

[AD-694529]

p0228 A70-15650

SHOCK WAVE GENERATORS

MHD power plant research and development, discussing shock wave electric power generators and modulated systems

p0146 A69-28469

SHOCK WAVES

Plasma expansion in uniform guide field and plasma flow kinetic energy conversion to thermal energy by shock wave due to magnetic barrier

p0134 A68-41790

Current and voltage distribution around normal shock in MHD duct using conformal transformation, considering continuous and segmented electrode boundary conditions

p0146 A69-25359

Magnetohydrodynamic flow in MHD ducts from point of view of boundary layer and shock wave theory

p0219 A69-26242

SHORT CIRCUITS

Vacuum thermionic converter with short-circuited triodes and increased electron transmission and conversion efficiency

[NASA-CASE-XLE-01015]

p0225 A69-39898

Standard solar cells calibrated in respect of air mass zero short circuit current

[ESRO-TN-79]

p0058 A70-30210

SHORT HAUL AIRCRAFT

Rotary wing aircraft ecological advantages in logging, off shore oil exploration and short haul passenger transport for airport size reduction

p0076 A73-33185

SIGNAL ANALYSIS

Signal analysis and power spectral density of fluctuations in series connected open cycle MHD generators

[AD-721454]

p0242 A71-28680

SILICATES

Sierra Nevada granite halos in biotite nuclei, discussing relation between biotite zircon content and halo production

p0071 A68-23286

SILICON

Thermoelectric converters efficiency as function of Si photocells optical characteristics

p0023 A68-18449

Thermoelectric converters efficiency as function of Si photocells optical characteristics

p0025 A68-39356

Power loss processes in Si solar cells, noting improvement in collection, voltage and curve factors

p0035 A71-16104

French R and D programs on Si and various thin film photovoltaic solar cells, considering efficiency, reliability, and weight and cost reduction problems

p0037 A72-28002

German Si and polycrystalline solar cells development survey, discussing interconnection techniques, module design and filter applications for performance improvements

p0037 A72-28003

Si solar cell efficiency in synchronous orbit radiation field increase via improvement in diffusion profile, low resistivity material and diode characteristics

p0039 A72-32131

Economic analysis of silicon solar cells production noting cost reduction from feasibility studies of edge defined film fed crystal growth in ribbon form

p0041 A73-14251

Design techniques for solar generators based on silicon photovoltaic cells

p0050 A68-28740

Radiation damage on silicon solar cells - development of cadmium telluride and cadmium sulfide cells

p0055 A69-35592

SILICON ALLOYS

Thermoelectric and mechanical performance of silicon-germanium solar thermoelectric generator

[NASA-CR-72340]

p0046 A68-12252

- SILICON CARBIDES**
 Costs and flow charts for thorium and uranium recovery from HTGR fuel elements containing silicon carbide coated fissile and fertile particles
 [GAMD-8661] p0083 N69-17117
 Silicon carbide unijunction diodes feasibility as solar cells and fabrication techniques
 [NASA-CR-73444] p0059 N70-37465
 Chemical, X ray diffraction, electron microscopic, and structural analysis of silicon carbide ceramics for open cycle magnetohydrodynamic generators
 p0243 N71-35623
- SILICON COMPOUNDS**
 Parametric analysis of radioisotope cascaded thermoelectric generators with Si-Ge first stage and PbTe second stage
 [NASA-TM-X-1501] p0192 N68-14585
 Effective volume power density analysis for radioisotope power generator with silicon germanium thermoelectric elements
 [NASA-TM-X-1453] p0193 N68-14630
- SILICON CONTROLLED RECTIFIERS**
 Series inverter silicon controlled rectifier 2800 watt dc power supply, noting high efficiency, low weight and stable voltage regulation
 p0176 A72-11064
- SILICON FILMS**
 High electric power output Si solar cell development, discussing increased energy conversion efficiency
 p0038 A72-28026
 Si solar cell design for high power/weight ratio and extreme environmental operating conditions, describing technological innovations for reliability and efficiency enhancement
 p0039 A72-37780
 Principle, production, and efficiency of silicon solar cells for spacecraft power supply
 [RF-89-C] p0052 N69-11991
- SILICON JUNCTIONS**
 Si p-n junction for solar energy conversion, comparing electrical and spectral response characteristics for B and P diffused impurities
 p0024 A68-31623
 Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination
 p0027 A69-35679
 Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination
 p0039 A72-34264
 Solar cells with Si Schottky function diode, discussing fabrication and barrier metal and thickness effects on output power and energy conversion efficiency
 p0042 A73-16816
- SILICONES**
 Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector
 [ASME PAPER 73-ZN45-7] p0045 A73-37969
- SILVER**
 High energy density silver-hydrogen cells for space and terrestrial applications.
 p0188 A73-38403
- SILVER ZINC BATTERIES**
 Radioisotope heater as heat source for maintaining silver-zinc battery temperatures in low ambient environment
 p0261 A68-25659
 Alternative power sources as replacements for mercury cells
 [AD-675936] p0264 N69-11907
 Design and performance of SEPT 2 spacecraft electrical power system
 [NASA-TM-X-2234] p0061 N71-20471
- SIMULATORS**
 Design of solar array simulators used in ground tests of spacecraft power supply systems
 p0064 N72-31077
- SINGLE CRYSTALS**
 Thin-film solar cells for large-area arrays
 p0058 N70-30231
- SINGLE-PHASE FLOW**
 Nonlinear dynamic model of nuclear power plants with single-phase coolant reactors
 [AE-341] p0217 N69-21373
- SIZE (DIMENSIONS)**
 Electrode size effects on combustion driven MHD generator performance, examining voltage losses, gas boundary layer temperature and surface conditions
 p0169 A70-40005
 Electrode size effects on voltage loss and boundary layer conductivity of combustion driven MHD generator
 p0173 A71-29880
 Increased thermal efficiency and increased Diesel engine size economics
 [REPT.-1] p0081 N68-24990
 Molybdenum electrode size effect on performance of magnetohydrodynamic generator
 [AD-694039] p0228 N70-14933
- SLAGS**
 Identification and mapping of coal refuse banks in Pennsylvania anthracite coal fields from ERTS-1 data
 [PAPER-124] p0110 N73-28319
- SLOTS**
 MHD induction generator efficiency, investigating winding slot finite spacing and width effects
 p0166 A70-30531
- SMOKE**
 Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio
 [E72-10259] p0102 N73-12358
- SMOKE TRAILS**
 Kerosene type fuels for aircraft gas turbine engines, discussing combustion problems, smoke emission reduction and bacterial or fungal contamination
 p0074 A71-28754
- SNAP**
 Thermoelectric converters for direct thermal to electric energy conversion, citing SNAP isotopic generator space power systems
 p0119 A68-11240
 Design and operational test data on SNAP, and nuclear reactor, conversion equipment, and spacecraft power systems technology
 p0192 N68-12191
 Radioactive isotopes as sources of heat and radiation with applications for spacecraft power and propulsion and terrestrial uses in SNAP
 p0082 N68-30262
 Isotopic energy sources for space applications
 p0226 N70-11304
 Nuclear electric power systems for space use
 p0228 N70-16220
- SNAP 8**
 SNAP 8 35 kW nuclear electric space power system
 [NASA-TM-X-61161] p0264 N68-33238
 Startup testing of SNAP 8 power conversion system
 [NASA-TM-X-52822] p0233 N70-29864
 Performance characteristics of SNAP 8 and solar cell electrical generating systems for lunar bases
 p0237 N70-39278
- SNAP 13**
 SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times
 p0155 A69-29191
- SNAP 19**
 SNAP 19 thermoelectric generator technology development
 [MND-3607-239-3, v. 3] p0207 N68-37951
 SNAP 19 residual fire test on its dispersion system generator, dispersion system capsule, intact reentry heat source generator system, and intact reentry heat source capsule
 [SC-DR-69-490] p0230 N70-19359
- SNAP 21**
 Deep sea radioisotope fueled thermoelectric generator power supply system design
 [MMH-3691-20] p0191 N69-11382
 Deep sea radioisotope-fueled thermoelectric generator power supply system
 [MMH-3691-62] p0239 N71-15039

SNAP 29

SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
pC137 A68-42528

SOCIAL FACTORS

Social quantitative benefit vs risk assessment of new technologies, considering atomic power safety
p0007 A71-12120

Economically viable and socially acceptable second-generation SST, discussing technological developments for range/payload, airport noise and sonic boom improvements
[AIAA PAPER 73-15] p0009 A73-17608

SODIUM COOLING

Fuel depletion and sodium void coefficients, and economic evaluation of sodium cooled fast nuclear reactor
p0230 N70-22218

SOIL MAPPING

Aerial 35mm color photography for reconnaissance uranium exploration and soil and rock identification in Wyoming Tertiary basins
p0190 N72-26334

SOIL SCIENCE

Symposium proceedings on mineralogy and geophysics processing, uranium exploration, X ray fluorescence and neutron activation analysis, and oil field geophysics
p0084 N69-30776

SOILS

Heat transfer problems of earth buried space radioisotope heat sources
[SORIN-1/6C1] p0091 N70-21969

SOLAR ARRAYS

Solar array cost reduction.
p0039 A72-37642

Solar array and supporting technologies development, discussing manufacturing, handling, design qualification tests in space environment and comparison between fold-up and roll-up types
p0041 A73-14237

Cost goals for silicon solar arrays for large scale terrestrial applications.
p0041 A73-14250

Passive solar array orientation devices for terrestrial application.
p0043 A73-22440

Configuration survey of lightweight solar array power systems for future missions.
p0043 A73-22782

Near-equatorial synchronous orbit Satellite Solar Power Station system with photovoltaic cell arrays energy conversion into microwave power for transmission to earth
p0043 A73-23601

Concept for a high voltage solar array with integral power conditioning.
p0044 A73-26001

Solar array cost reductions.
p0044 A73-29592

Large area silicon solar array development.
p0044 A73-29593

Solar energy conversion development relative to Department of Defense space power requirements.
p0044 A73-29595

Some major terrestrial applications of solar energy.
p0045 A73-35312

Development of a lightweight body-mounted solar cell array with a high power to weight ratio.
p0046 A73-38408

Performance test on rollup solar array system and thermal bending tests on deployable boom
[NASA-CR-118006] p0061 N71-23714

Technological improvements for reducing costs of solar cells and solar arrays
[NASA-TM-X-68035] p0063 N72-21033

Design of low cost terrestrial photovoltaic power system using solar array
[NASA-CR-127631] p0064 N72-26034

Design of solar array simulators used in ground tests of spacecraft power supply systems
p0064 N72-31077

Development of solar energy powered heliostrobe assembly to orient solar array toward sun
[NASA-CASE-GSC-10945-1] p0065 N72-31637

Design, development, and evaluation of roll-up solar array rated at thirty watts per pound
[NASA-CR-128196] p0065 N72-32070

Review and evaluation of solar array technology
[NASA-CR-128533] p0065 N72-33057

Three major options for wide-scale generation of photovoltaic energy for terrestrial use
[NASA-CR-128381] p0065 N72-33061

Optimal design of baseline configuration for solar array panel with deployable beam
[NASA-CR-130287] p0066 N73-15079

Design and performance of solar array for Helios solar probe
[DGLR-PAPER-72-091] p0066 N73-15084

Solar array development discussing manufacturing, design qualification tests in aerospace environments, and comparison between fold-up and roll-up types
[RAE-TN-72109] p0067 N73-21959

Space station solar array technology evaluation program
[MSC-07163] p0068 N73-30057

SOLAR AUXILIARY POWER UNITS

Solar cells for onboard spacecraft energy supply, discussing design, operation and power output of various cells
p0024 A68-33039

Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources
p0174 A71-34227

Testing, fabrication, configuration selection, and electrical performance calculations in solar thermionic generator development
[NASA-CR-92520] p0047 N68-16074

Design and performance data of power subsystem in flight spacecraft Lunar Orbiter 3
[NASA-CR-100700] p0054 N69-29374

Design, development, and evaluation of roll-up solar array rated at thirty watts per pound
[NASA-CR-128196] p0065 N72-32070

SOLAR CELLS

Type III-V gallium arsenide solar cells technological construction and electrical properties
p0023 A68-15419

Kaufman electrical generator for use with solar cells in SERT 2 mission
p0023 A68-15882

Optimum configuration in large orbiting solar array design, considering configuration selection and environmental perturbations effects
p0023 A68-16784

Optimal power conversion from solar array to spacecraft battery, obtaining power coupling by using high efficiency switching techniques
p0023 A68-17380

Efficiency and performance limiting factors of single crystal and polycrystalline thin film cells
p0121 A68-17793

Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0023 A68-18449

Thin film solar cell materials, fabrication, structure and properties related to energy conversion efficiency in space applications
p0024 A68-20738

Efficiency limitations of solar energy collectors and receivers as converters in space applications
[AGARDGRAPH 81] p0024 A68-22525

Thermionic generator space power system using solar energy thermionic /SET/ diode array and incandescent radioisotope fuel block radiant heat source
p0128 A68-24403

Si p-n junction for solar energy conversion, comparing electrical and spectral response characteristics for B and P diffused impurities
p0024 A68-31623

Solar cells for onboard spacecraft energy supply, discussing design, operation and power output of various cells
p0024 A68-33039

Cds thin film solar cell noting advantages over silicon photovoltaic cells for converting light into electric energy
p0024 A68-34613

Large rigid modular deployable solar cell arrays technology, discussing future trends
p0025 A68-38889

- Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0025 A68-39356
- Materials limitations and problems for direct energy conversion methods of thermoelectricity, solar cells, thermionics and fuel cells
p0133 A68-41217
- Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941
- Cadmium sulfide thin film solar cell design for space applications
p0025 A68-42518
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1]
p0141 A69-16158
- GaAs photoelectric devices for radiation detection and light to electric energy conversion, considering photoresistors, photodiodes and solar cells
p0026 A69-27465
- Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons
p0027 A69-31287
- Gold donor level impurity photovoltaic effect in silicon, noting solar cell efficiency reduction due to minority carrier recombination
p0027 A69-35679
- Solar cell characteristics at low temperatures, noting efficiency increase with decreasing temperature
p0027 A69-35691
- 560 W deployable solar array consisting of very thin Si solar cells mounted on polyimide film, initiating deployment by duplicated pyrotechnic actuators
p0028 A69-35707
- Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides fabrication, costs, etc
p0028 A69-35708
- Shadow effects on current-voltage characteristics of solar cell array circuits, developing mathematical models
p0028 A69-35709
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1]
p0028 A69-36418
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc
p0028 A69-42271
- Hot spot failure modes in solar cell arrays noting protection through I-V characteristic control
p0028 A69-42273
- Deployment systems for extending large area lightweight flexible solar arrays in space, tabulating estimated design weights including power-weight ratios
p0031 A70-11932
- Solar cell array fabrication methods extending operating temperature by pulsed spot welding techniques and deletion of adhesives
p0031 A70-12080
- Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc
p0031 A70-15329
- Solar cell for improved performance during extreme temperature fluctuations, discussing wraparound contact
p0031 A70-16724
- GaAs solar cells performance as function of doping levels, ascribing poor efficiencies to surface recombinations
p0032 A70-21721
- Book on solar cells U.S. patent literature, discussing Si semiconductors, panel fabrication techniques, photoemissive devices, Cd, Ga and organic compounds, etc
p0032 A70-22050
- Oriented flexible rolled-up solar array /FEUSA/ for spacecraft electric power generation, describing orientation and deployment mechanisms, solar panel, system operation, etc [AIAA PAPER 70-738]
p0032 A70-25434
- Design requirements for solar cells and arrays as function of illumination, orbit, geometry and type of stabilization, space environment, etc
p0032 A70-29554
- Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide, discussing preparation methods and photoelectric and electric properties
p0033 A70-36238
- Collection efficiency and spectral response calculations for semiconductor heterojunction solar cells
p0033 A70-40623
- Silicon solar cell specifications and cost reduction without output or reliability loss
p0033 A70-41008
- Solar arrays for Venus-Mercury flyby, evaluating temperature and power performance
p0033 A70-41010
- CdS thin film solar cells, describing manufacture for increased degradation resistance
p0033 A70-43537
- Integrated high voltage CdS solar batteries with interconnected cells in series without grid
p0034 A71-16058
- Si solar cells low temperature and solar intensity performance optimization by identifying and eliminating low output problems
p0034 A71-16071
- Si solar cells lightweight economical deployable arrays, discussing temperature performance, assembly, coverslips, interconnection, stowage and telescopic mast and ends
p0034 A71-16099
- Electrical power generation from sunlight without pollution, using solar cell elevated rug technology
p0034 A71-16100
- Si solar cells with high electrical output in space sunlight, discussing device limitations
p0034 A71-16102
- Si solar cell technology, discussing contacts, low temperature performance and conversion efficiency
p0034 A71-16103
- Power loss processes in Si solar cells, noting improvement in collection, voltage and curve factors
p0035 A71-16104
- Energy conversion efficiency improvement of silicon solar cells, noting power loss effects
p0036 A71-29702
- Solar to electric energy conversion efficiency and electrical properties of photoconverters using compressed sintered CdS
p0036 A71-44390
- Cylindrical solar array absorptance as function of solar flux vector inclination, using Gier-Dunkle integrating sphere [AIAA PAPER 72-57]
p0037 A72-16909
- Solar cells with improved photoelectric efficiency, describing use of noncorroding Ti-Pd-Ag contacts, titanium oxide antireflection layer and welded cell joints
p0037 A72-17751
- Cooling system based on vaporization of solar cell preheated solution drawn through chamber with atomizing injector
p0037 A72-24314
- French B and D programs on Si and various thin film photovoltaic solar cells, considering efficiency, reliability, and weight and cost reduction problems
p0037 A72-28002
- German Si and polycrystalline solar cells development survey, discussing interconnection techniques, module design and filter applications for performance improvements
p0037 A72-28003
- Thin film Cu-CdS solar cell electrochemical plating potential and solution composition effects on copper sulfide surface layer formation and cell efficiency
p0038 A72-28008
- Improved efficiency of cadmium sulfide-copper sulfide thin film solar cells, noting optimization of layer formation, gridding and encapsulation
p0038 A72-28016

SUBJECT INDEX

SOLAR CELLS CONTD

Radiovoltaic generator energy conversion by thin film solar cells, noting performance dependence on semiconductor band gap and radioisotope characteristics p0038 A72-28021

High electric power output Si solar cell development, discussing increased energy conversion efficiency p0038 A72-28026

Silicon solar cell fabrication technology developments for long mission life performance reliability over wide temperature and radiation intensity ranges p0038 A72-28029

Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies p0038 A72-28034

Si solar cell efficiency in synchronous orbit radiation field increase via improvement in diffusion profile, low resistivity material and diode characteristics p0039 A72-32131

Si p-n junction solar cell fill factor for electric power available to load, noting discrepancy between calculated and measured values due to recombination p0039 A72-34264

Si solar cell design for high power/weight ratio and extreme environmental operating conditions, describing technological innovations for reliability and efficiency enhancement p0039 A72-37780

High-efficiency Ga_{1-x}Al_xAs-GaAs solar cells. p0040 A73-10132

Secondary ionisation and its possible bearing on the performance of a solar cell. p0040 A73-12048

Photovoltaic Specialists Conference, 9th, Silver Spring, Md., May 2-4, 1972, Record. p0040 A73-14203

Tables summarizing Si solar cell fabrication parameters, complex design evolution and performance achievement p0040 A73-14204

Solar cell graded band gap materials, determining I-V characteristics, junction capacitance and photovoltaic spectral response p0040 A73-14207

Silicon solar cell design, describing handbook organization and derivation of design curves and data tables p0040 A73-14209

Laser energy conversion into electrical energy with photovoltaic cells, noting Si and GaAs cells power efficiencies improvement compared to operation in sunlight p0040 A73-14210

Silicon violet solar cell energy conversion efficiency improvement through extended spectral response and increased fill factor p0040 A73-14212

Minority carrier lifetime and diffusion constant as function of impurity concentration in double junction vertical solar cell, determining power efficiency p0041 A73-14213

High efficiency Cu₂S-CdS-solar cells with improved thermal stability. p0041 A73-14216

New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell. p0041 A73-14220

Investigations of the inhomogeneity of polycrystalline Cu₂S-S-CdS solar cells, p0041 A73-14222

Solar cell optical properties effects on electrical and thermal performance and cost savings in panel design optimization p0041 A73-14226

Fabrication criteria, mission design factors and I-V characteristics of Li solar cells p0041 A73-14242

Cost goals for silicon solar arrays for large scale terrestrial applications. p0041 A73-14250

Economic analysis of silicon solar cells production noting cost reduction from feasibility studies of edge defined film fed crystal growth in ribbon form p0041 A73-14251

Solar cells with Si Schottky function diode, discussing fabrication and barrier metal and thickness effects on output power and energy conversion efficiency p0042 A73-16816

A system for the evaluation of solar cell samples. p0042 A73-22438

Power Sources Symposium, 25th, Atlantic City, N.J., May 23-25, 1972, Proceedings. p0187 A73-29581

Historical development of solar cells. p0044 A73-29590

Principles of photovoltaic solar energy conversion. p0044 A73-29591

Research plans for solar power in space. p0044 A73-29594

CdTe thin film fabrication by direct synthesis of vacuum evaporated Cd and Te, noting solar cell efficiency increase after storage in room temperature exsiccator p0045 A73-30475

Design concepts for planetary solar array [NASA-CR-91730] p0046 N68-14185

Design and performance of two vacuum chambers and solar-radiation simulators for solar-cell research [NASA-TN-X-1503] p0047 N68-16695

Historical review of scientific work on photovoltaic effects and on energy conversion devices using this effect [NASA-CR-92679] p0047 N68-16882

Photovoltaic efficiency of photodiodes in solar cells p0199 N68-17828

Satellite power supply control systems analysis of solar cell array battery [ESRO-TN-54/ESTEC/] p0047 N68-18466

NASA educational facts on present and future electric power sources for space application [NASA FACTS-WF-38] p0048 N68-19128

Materials, plasma, and electrochemical research on unconventional energy conversion techniques [NASA-CR-93979] p0010 N68-21035

Feasibility of 30 watts per pound roll-up solar array - design of engineering demonstration model with deployability of selected flight configuration and thermal cycling tests of array [NASA-CR-94243] p0048 N68-21879

Mechanized module technique for fabrication of heat resistant solar cell collectors and panels [RP-93-0] p0048 N68-22010

Program review on critical areas of technology associated with solar cell battery power systems for manned spacecraft [NASA-CR-94551] p0049 N68-23528

Radiation damage and temperature dependence data on silicon solar cell arrays p0050 N68-28741

Technology for fabricating cadmium telluride solar photoelectric cells with improved energy conversion efficiency p0050 N68-28744

Germanium solar photoelectric cells for high intensity solar energy conversion devices p0050 N68-28746

Solar and radioisotope Brayton cycle power supplies [NASA-TN-X-52438] p0051 N68-31096

Design and performance of silicon solar cells for electrical power generation [NASA FACTS S-6/3-68] p0051 N68-31526

Design, construction, and testing of preliminary 30 watts per pound roll-up solar array [NASA-CR-96230] p0051 N68-32561

Development and testing of cadmium sulfide thin film solar array subpanels [NASA-CR-72439] p0051 N68-33207

Lithium-diffused p-n silicon solar cells of high conversion efficiency and improve resistance to space radiation effects [NASA-CR-97077] p0051 N68-35814

Parametric performance and design criteria for assessing feasibility of large solar array and fuel cell systems as primary power source for lunar-based water electrolysis system [NASA-CR-61979] p0051 N68-36000

SOLAR COLLECTORS

SUBJECT INDEX

- Principle, production, and efficiency of silicon solar cells for spacecraft power supply
[RF-89-0] p0052 N69-11991
- Solar energy transmission measurements of plastic films used as solar cells for weather balloons
[NASA-CR-73711] p0053 N69-16975
- Plastic substrate, cadmium sulfide thin film solar cell
[NASA-CR-72534] p0054 N69-23369
- Computer program developed to determine charged-particle irradiation effect on single solar cell power output
[NASA-TN-X-63559] p0054 N69-27843
- Magnetohydrodynamic flow, surface properties, silicon solar cells, and thermoelectric properties of graphite compounds
p0223 N69-34812
- Design criteria for integrated lightweight flexible silicon solar cell arrays
[NASA-CR-106379] p0056 N69-40952
- Solar cell efficiencies computed for semiconductor heterojunction cells
[NASA-CR-49827] p0056 N70-12119
- Solar cell panel configuration on PLO launch vehicle
[REPT-RT-68/719] p0057 N70-17839
- Spacecraft power supply design with emphasis on converter design
p0057 N70-24832
- Analysis of solar cell array systems for cost effectiveness in production and design
[NASA-CR-109527] p0057 N70-25500
- Annotated bibliography on solar cells and panels
[AD-700400] p0058 N70-29273
- Selection of materials and techniques for solar array design
[ESRO-CR-12] p0058 N70-30140
- Standard solar cells calibrated in respect of air mass zero short circuit current
[ESRO-TN-79] p0058 N70-30210
- Performance of actual solar cells compared with theoretical predictions
p0058 N70-30229
- Thin-film solar cells for large-area arrays
p0058 N70-30231
- Standard solar cells calibrated in respect of air mass zero short circuit current
p0059 N70-30232
- Combining thermionic converter with solar cell in solar power array
[AD-700400] p0059 N70-36227
- Silicon carbide unijunction diodes feasibility as solar cells and fabrication techniques
[NASA-CR-73444] p0059 N70-37465
- Solar panel test set for testing solar cells with artificial light source
[AD-707345] p0059 N70-38210
- Performance characteristics of SNAP 8 and solar cell electrical generating systems for lunar bases
p0237 N70-39278
- Development of integrated lightweight flexible silicon solar cell array
[NASA-CR-110913] p0059 N70-43081
- Fabrication methods for matrices of solar cell submodules
[NASA-CASE-XNP-05821] p0060 N71-11056
- Fabricating large solar array of thin silicon cells mounted on Kapton polyimide film with 560 W output
[RAE-TN-69067] p0060 N71-11063
- Development and characteristics of lithium-doped solar cells
[NASA-CR-116220] p0060 N71-16472
- Manufacturing processes for production of solar cells
p0060 N71-17248
- Space erectable rollup solar array of arcuate solar panels furled on tapered drum for spacecraft storage during launch
[NASA-CASE-NPO-10188] p0061 N71-20273
- Design and performance of SERT 2 spacecraft electrical power system
[NASA-TN-X-2234] p0061 N71-20471
- Preliminary design, fabrication, and test of lightweight solar panel of built-up beryllium structure with 29 sq ft active cell area
[NASA-CR-117349] p0061 N71-20727
- Method and apparatus for fabricating solar cell panels
[NASA-CASE-XNP-03413] p0062 N71-26726
- Flight testing of cadmium sulfide thin film solar cells for stability and efficiency
[AD-723315] p0062 N71-31939
- Development and characteristics of solar cells with phosphors in cover glass to improve response to solar ultraviolet radiation
[NASA-CASE-ARC-10050] p0062 N71-33409
- Research and development on silicon solar cell with improved efficiency
[NASA-CR-121751] p0062 N71-34042
- Establishing solar cell array criteria for use as primary power source in lunar-based water electrolysis system
[NASA-CR-119945] p0062 N71-36441
- Development of technology for fabricating and integrating solar cell array into deployable system
[NASA-CR-112002] p0063 N72-13046
- Tests of cadmium sulfide solar cells under simulated space environmental conditions
[NASA-CR-120840] p0063 N72-14029
- Cost analysis of large scale solar cell power for terrestrial applications
[NASA-TN-X-2520] p0063 N72-19057
- Technological improvements for reducing costs of solar cells and solar arrays
[NASA-TN-X-68035] p0063 N72-21033
- Cost effectiveness of solar cell space power systems
[NASA-TN-X-68054] p0063 N72-25022
- Technical feasibility of improving efficiency of solar cells for space programs
[NASA-CR-127234] p0064 N72-27055
- Considerations, conclusions, and recommendations for improving efficiency of solar cells
p0064 N72-27056
- Physical processes underlying solar-energy conversion through photovoltaic effect
p0064 N72-27057
- Analysis of loss mechanisms in silicon solar cells and their impact on conversion efficiency
p0064 N72-27059
- Three major options for wide-scale generation of photovoltaic energy for terrestrial use
[NASA-CR-128381] p0065 N72-33061
- Feasibility of using photovoltaic cells to convert laser energy into electrical energy
[LA-DC-72-468] p0065 N73-12061
- Design and performance of solar array for Helios solar probe
[DGLR-PAPER-72-091] p0066 N73-15084
- Analysis of silicon solar cells to show factors controlling blue response and methods for improvement
[NASA-CR-131090] p0066 N73-19059
- Design and fabrication of wraparound contact silicon solar cells
[NASA-CR-121003] p0067 N73-20044
- Production cost optimization for thermoelectric solar cell
[AD-759812] p0068 N73-25104
- Techniques for improving performance of gallium arsenide solar cells by ion implantation
[NASA-CR-135510] p0068 N73-30977
- Fabrication techniques for lithium-doped silicon solar cells
[AD-764357] p0068 N73-30982
- SOLAR COLLECTORS**
- Optimal dimensions for high temperature cylindrical cavity solar energy receivers by studying concentrator and receiver operation
p0023 A68-12549
- Efficiency limitations of solar energy collectors and receivers as converters in space applications
[AGARDGRAPH 81] p0024 A68-22525
- Large rigid modular deployable solar cell arrays technology, discussing future trends
p0025 A68-38889
- Solar radiant energy distribution pattern and temperature in focus of parabolic cylinder concentrator constructed of plane mirror elements
p0025 A68-41092
- Design concept for rollup solar array configuration, discussing structural stability, power-to-weight ratio and analytical model
p0025 A68-42560

SUBJECT INDEX

SOLAR COLLECTORS CONTD

- Computation and optimization of energy distribution over randomly oriented elements of radiation receiving surface of hollow collector of concentrator type solar device
p0026 A69-22534
- Solar power concentrator-absorber system, discussing flux distribution in focal plane and cavity heater optimization
p0027 A69-33795
- Direct solar radiation concentration by paraboloid mirrors, analyzing energy transport and distribution functions, based on statistically distributed imperfections of reflecting surfaces
p0030 A70-10762
- Absorber positioning inaccuracy influence in concentrating solar unit mirror on unit energy parameters, discussing defocusing
p0030 A70-10763
- Solar installations optical properties selectivity increase by light-collecting surfaces mechanical treatment, describing plate grinding with abrasive powders
p0031 A70-19625
- Design requirements for solar cells and arrays as function of illumination, orbit, geometry and type of stabilization, space environment, etc
p0032 A70-29554
- Methods for the quality control of the reflecting surfaces of solar energy condensers /Survey/
p0040 A72-43187
- Linear solar collector conversion efficiency over wide operating temperature range via model consisting of long pipe with energy injection at points along length
[ASME PAPER 72-WA/SOL-7]
p0042 A73-15802
- The Solar Collector Thermal Power System - Its potential and development status.
p0043 A73-22792
- Brayton cycle solar dynamic turboalternator space electric power system technology developments during 1962-1972, considering power efficiency, components reliability and future missions
p0185 A73-25982
- Analysis of the parameters of solar-heat power sources with energy storage units
p0045 A73-34283
- An analysis of linear focused collectors for solar power.
p0046 A73-38409
- Mathematical model of solar collection limitations for dynamic converters
p0047 N68-17795
- Limitations of solar collectors and receivers for space applications
p0047 N68-17804
- Parametric analysis of effects of concentrator surface errors and rim angle, collection system orientation error, and receiver temperature on paraboloid solar collector thermal efficiency
[NASA-TN-D-4415]
p0047 N68-18998
- Feasibility of 30 watts per pound roll-up solar array - design of engineering demonstration model with deployability of selected flight configuration and thermal cycling tests of array
[NASA-CR-94243]
p0048 N68-21879
- Mechanized module technique for fabrication of heat resistant solar cell collectors and panels
[RP-93-01]
p0048 N68-22010
- Geometric properties of expandable whirling membrane solar energy concentrator used in conjunction with electrical conversion systems for spacecraft auxiliary power units
[NASA-TN-D-4532]
p0048 N68-22258
- Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings
[NASA-TT-P-11659]
p0048 N68-22401
- Fabrication and test performance of solar thermionic collector-radiator heat pipe structure
[NASA-CR-94402]
p0048 N68-22991
- Design, construction, and testing of preliminary 30 watts per pound roll-up solar array
[NASA-CR-96230]
p0051 N68-32561
- Calorimetric, optical, and vibration investigation of stretch-formed aluminum solar concentrators for thermionic converters
[NASA-TN-D-4889]
p0052 N69-10708
- Theoretical analysis and experimental verification of two phase heat transfer characteristics of combined solar collector-heat engine generator for solar air conditioner
p0053 N69-17227
- Calorimetric efficiency of cone and column solar energy concentrator
[NASA-TN-D-5109]
p0053 N69-21088
- Expanding and contracting connector strip for solar cell array of Nimbus satellite
[NASA-CASE-XGS-01395]
p0053 N69-21539
- Electron bombardment ion engine having 0.015 N thrust, 30 km/sec exhaust velocity, and 550 W deployable solar array proposed for Black Arrow X5 spacecraft
[RAE-TR-68191]
p0054 N69-24137
- Calorimetric evaluation of three 1.5-meter diameter inflatable rigidized solar concentrators for solar dynamic cycle power systems
[NASA-TN-D-5234]
p0054 N69-28123
- Fabrication and test evaluation of lightweight solar panels
[NASA-CR-66832]
p0055 N69-38646
- Structural analyses on space vehicle insulation, solar panels, and temperature sensor responses
p0057 N70-22865
- Performance tests of flight worthiness of SERT array module
[NASA-CR-72706]
p0058 N70-28421
- Combining thermionic converter with solar cell in solar power array
[AD-704002]
p0059 N70-36227
- Concentrator device for controlling direction of solar energy onto energy converters
[NASA-CASE-XLE-01716]
p0059 N70-40234
- Performance characteristics and weight variations of large area, roll-up, solar arrays
[NASA-CR-115821]
p0060 N71-13427
- Space erectable rollup solar array of arcuate solar panels furling on tapered drum for spacecraft storage during launch
[NASA-CASE-NPO-10188]
p0061 N71-20273
- Flexible rolled-up solar array module thermal cycling tests
[NASA-TN-X-52995]
p0061 N71-21206
- Performance test on rollup solar array system and thermal bending tests on deployable boom
[NASA-CR-118006]
p0061 N71-23714
- Evaluation of solar mirror surface materials by ATS 3 reflectometer
p0061 N71-25311
- Storage stable, thermally activated foaming compositions for erecting and rigidizing mechanisms of thin sheet solar collectors
[NASA-CASE-LAR-1C373-1]
p0062 N71-26155
- Development and characteristics of solar cells with phosphors in cover glass to improve response to solar ultraviolet radiation
[NASA-CASE-ARC-10050]
p0062 N71-33409
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282]
p0018 N72-13391
- Thermal response of bimetal thermostat solar array orientation device
p0063 N72-13396
- Development of double mirror solar energy concentrator with nickel parabolic reflectors to increase maximum flux density
[AD-741880]
p0064 N72-29046
- Optimal design of baseline configuration for solar array panel with deployable beam
[NASA-CR-130287]
p0066 N73-15C79
- Analysis of silicon solar cells to show factors controlling blue response and methods for improvement
[NASA-CR-131090]
p0066 N73-19059
- Design of solar energy concentrators with concentric circular seams of plastic films
[AD-755829]
p0067 N73-21712
- Analysis of methods for meeting national energy requirements with emphasis on technology for using solar energy
[NASA-TN-X-68230]
p0067 N73-22748
- Flat plate collector performance evaluation using simulated sun
[NASA-TN-X-71427]
p0068 N73-32655

- Analysis of linear focused collectors for solar power
[SLA-73-5319] p0068 N73-33007
- SOLAR ENERGY**
- Si p-n junction for solar energy conversion, comparing electrical and spectral response characteristics for B and P diffused impurities
p0024 A68-31623
- Electromagnetic energy, examining solar energy conversion into electricity
p0025 A68-46644
- Solar radiant energy distribution pattern and temperature in focus of parabolic cylinder concentrator constructed of plane mirror elements
p0025 A68-41092
- Satellite power generation and transmission system for solar energy conversion, noting estimates of surface area and weight of collectors
p0026 A69-12296
- Biological conversion of solar energy, discussing photosynthesis and nonphotosynthesis mechanisms
p0032 A70-31600
- Passive sun trackers using solar energy activated bimetal helix thermal heliotrope
p0033 A70-34131
- Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth
p0035 A71-28665
- Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems
p0035 A71-28666
- Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth
p0035 A71-28671
- Solar energy conversion as pollution-free power source, discussing silicon solar cells, power transmission techniques, satellite solar power stations and system control and guidance
p0037 A72-18625
- Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties
p0037 A72-24315
- Cost efficiency and relative economic merits prediction for solar energy conversion systems
p0037 A72-24316
- A universal power characteristic of a high-temperature solar heat source
p0039 A72-35516
- Large-scale concentration and conversion of solar energy.
p0039 A72-36075
- The impact of aerospace technology on energy conversion in the 70's.
[ASME PAPER 72-AERO-11] p0008 A72-43147
- Synchronous satellite solar power station for solar energy conversion to microwaves for transmission to earth discussing technical, economic and social aspects
[ASME PAPER 72-WA/SOL-6] p0042 A73-15871
- Satellite solar power station for solar energy conversion and transmission to earth via microwave beam, discussing technology status and weight and cost projections
p0042 A73-18027
- Electrical and isotope power from space for terrestrial use.
p0042 A73-18028
- Spacecraft dynamic solar electric power/thermal control system with cold liquid flow and regenerator cooling for energy conversion efficiency and weight characteristics improvements
p0043 A73-22785
- Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams
p0043 A73-22791
- Satellite electric power station for conversion of solar energy to microwaves beamed to earth, discussing structural design, flight control, transportation and technology assessment
p0044 A73-24554
- Principles of photovoltaic solar energy conversion.
p0044 A73-29591
- Solar energy conversion development relative to Department of Defense space power requirements.
p0044 A73-29595
- The utilization of solar energy to help meet our nation's energy needs.
p0045 A73-32193
- Analysis of the parameters of solar-heat power sources with energy storage units
p0045 A73-34283
- Some major terrestrial applications of solar energy.
p0045 A73-35312
- Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass envelope improvement
[AIAA PAPER 73-710] p0045 A73-36331
- Intersociety Energy Conversion Engineering Conference, 8th, University of Pennsylvania, Philadelphia, Pa., August 13-16, 1973, Proceedings and Addendum.
p0188 A73-38386
- A solar engine using the thermal expansion of metals.
p0046 A73-38473
- General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power
[FTD-MT-64-355] p0203 N68-26786
- Performance of expandable whirling membrane solar energy concentrator for space power conversion
[NASA-TM-X-59872] p0049 N68-27564
- Solar energy concentrator technology, design, and fabrication techniques
[NASA-TM-X-59843] p0049 N68-27643
- Performance of expandable whirling membrane solar energy concentrator
[L-5484] p0049 N68-27926
- Ionospheric MHD generator based on utilizing solar energy
[JPRS-46941] p0214 N69-13670
- Development of regenerator for use as Brayton cycle space power system using solar energy
[NASA-CR-108945] p0057 N70-20627
- Solar charger kit for nickel cadmium battery of integrated observation system
[AD-734809] p0063 N72-19066
- Physical processes underlying solar-energy conversion through photovoltaic effect
p0064 N72-27057
- Maximum efficiency of solar energy conversion for photovoltaic cells
p0248 N72-27058
- Development of double mirror solar energy concentrator with nickel parabolic reflectors to increase maximum flux density
[AD-741880] p0064 N72-29046
- Feasibility analysis for utilization of solar energy in developing countries
[PB-208550] p0064 N72-31092
- Photoelectric, thermoelectric, and thermoemission methods of converting solar to electrical energy
[AD-747293] p0065 N73-11050
- Conversion and utilization of solar energy to solve energy shortages and pollution problems on earth
p0066 N73-13866
- Conversion of solar energy to pollution free power
p0019 N73-13870
- Congressional hearings on earthbound potential utilization of solar energy
p0066 N73-14812
- Development of surfaces and coatings for solar energy conversion systems
[NASA-TT-F-14650] p0066 N73-15598
- Analysis of methods for meeting national energy requirements with emphasis on technology for using solar energy
[NASA-TM-X-68230] p0067 N73-22748
- Reliability analysis of thermoelectric module solar energy converter
[AD-757087] p0067 N73-23015
- Applications of solar energy to heat and power requirements
[NASA-CR-133101] p0068 N73-26818
- Solar energy, thermonuclear energy, and fission fuel energy sources
[UCRL-74697] p0022 N73-33005

- Analysis of linear focused collectors for solar power
[SLA-73-5319] p0068 N73-33007
- Conference on use of solar energy in Mediterranean
[BULL-22] p0069 N73-33762
- Heliotechnique for utilizing solar energy on earth
p0069 N73-33763
- SOLAR ENERGY ABSORBERS**
- Optical dimensions for high temperature cylindrical cavity solar energy receivers by studying concentrator and receiver operation
p0023 A68-12549
- Efficiency limitations of solar energy collectors and receivers as converters in space applications
[AGARDOGRAPH 81] p0024 A68-22525
- Computation and optimization of energy distribution over randomly oriented elements of radiation receiving surface of hollow collector of concentrator type solar device
p0026 A69-22534
- Solar power concentrator-absorber system, discussing flux distribution in focal plane and cavity heater optimization
p0027 A69-33795
- High temperature solar energy converter cavity absorbers geometry, considering absorption parameters of radiation reflected by concentrator
p0030 A70-10761
- Absorber positioning inaccuracy influence in concentrating solar unit mirror on unit energy parameters, discussing defocusing
p0030 A70-10763
- Solar energy absorbers and thermal storage devices for high temperature energy conversion to electric power by thermionic or thermoelectric method
p0030 A70-10764
- Orbital mission solar energy power conversion system, discussing heat transfer processes for storage feasibility
p0033 A70-41852
- Methods for the quality control of the reflecting surfaces of solar energy condensers /Survey/
p0040 A72-43187
- Calculation of the solar radiation incident on an inclined ribbed surface
p0040 A72-43194
- Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass-envelope improvement
[AIAA PAPER 73-710] p0045 A73-36331
- Titanium alloy honeycomb with blackened walls as absorber of solar energy
[NASA-TN-D-4727] p0050 N68-30751
- Solar absorptances and spectral reflectances of metals
[NASA-TN-D-5353] p0055 N69-31895
- Geometric properties of paraboloidal whirling membrane solar energy concentrators
[NASA-TN-D-5859] p0058 N70-29807
- Performance characteristics and weight variations of large area, roll-up, solar arrays
[NASA-CR-115821] p0060 N71-13427
- Design and performance of roll-up solar array engineering model
p0061 N71-22561
- Thermodynamics of honeycomb porous bed solar generators with and without fluid transpiration including generator designs
p0062 N71-28586
- SOLAR FLUX**
- Cylindrical solar array absorptance as function of solar flux vector inclination, using Gier-Dunkle integrating sphere
[AIAA PAPER 72-57] p0037 A72-16909
- SOLAR FURNACES**
- High temperature solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using solar furnace
p0032 A70-30907
- Temperature measurement of products in solar furnace by IR pyrometers, considering interference filters, reflections parasitic effects, etc
p0032 A70-32424
- High temperature and vacuum solar furnace processing of refractory metals in space or on moon
p0039 A72-37675
- Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- Mathematical analysis of high temperature solar furnace characteristics
[AD-704754] p0059 N70-32426
- Lens assembly for solar furnace or solar simulator
[NASA-CASE-XNP-04111] p0069 N71-15622
- Developments in vacuum diffusion welding methods and metallurgical applications of solar energy
[NIL-M-22830-(5828.4P)] p0067 N73-20584
- SOLAR GENERATORS**
- Optimum configuration in large orbiting solar array design, considering configuration selection and environmental perturbations effects
p0023 A68-16784
- USAF Advanced Solar Turbo Electric Concept /ASTEC/ for space vehicle power requirements
p0023 A68-20595
- Large rigid modular deployable solar cell arrays technology, discussing future trends
p0025 A68-38889
- Electromagnetic energy, examining solar energy conversion into electricity
p0025 A68-40644
- Solar energy storage optimization for satellite and space vehicle power systems, discussing thermal collection in heat sinks and electric batteries
p0026 A68-43812
- Direct energy conversion and materials limitations, discussing thermoelectricity, solar cells, thermionics and fuel cells
p0140 A69-11801
- Satellite power generation and transmission system for solar energy conversion, noting estimates of surface area and weight of collectors
p0026 A69-12296
- Design and performance equations for panel type solar thermoelectric generator, based on single thermocouple as generator unit
p0026 A69-15675
- Electrical testing of six converter solar energy thermionic generator, discussing overheating and dual current mode anomalies
p0026 A69-21823
- Heat conversion coefficients and initial temperature of active elements of solar powered electric devices
p0151 A69-28314
- Solar conversion efficiencies of p-n and n-p diodes calculated for specified semiconductor heterojunctions using Anderson diffusion model
p0026 A69-30034
- Thermal contacts effects on optimum operating conditions of solar thermoelectric power generator, discussing losses due to low thermal conductivity coefficient of insulating layers
p0027 A69-32797
- Faceted reflector for solar power installations with photoelectric converters, discussing reflector construction, efficiency and energy balance
p0027 A69-32798
- Reradiation and multiple reflection effects on radiant flux density distribution in cylindrical receivers of solar power installations
p0027 A69-32799
- Solar power concentrator-absorber system, discussing flux distribution in focal plane and cavity heater optimization
p0027 A69-33795
- Large solar array systems in space, discussing design and operation
p0027 A69-35056
- Hot spot failure modes in solar cell arrays noting protection through I-V characteristic control
p0028 A69-42273
- Soviet papers on semiconductor solar energy converters covering design and tests for thermoelectric, thermionic and photoelectric units, properties, materials, etc
p0029 A70-10750

- Semiconductor solar thermoelectric generator allowing thermoelement replacement during service including construction, bridging methods and characteristics p0030 A70-10751
- Current-voltage characteristics of cascaded solar thermoelectric generator, determining optimum hot junction temperature as function of radiation concentration p0030 A70-10752
- Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect p0162 A70-10754
- Solar energy absorbers and thermal storage devices for high temperature energy conversion to electric power by thermionic or thermoelectric method p0030 A70-10764
- Selective glass coatings applications in solar thermoelectric generators working without radiation concentrators p0031 A70-10767
- Photoelectric composite multicell solar generator, deriving empirical equation for external I-V characteristic p0031 A70-19623
- Solar thermoelectric generator /STEG/ with two stage converter, discussing weight factors and efficiency p0032 A70-32425
- Orbital mission solar energy power conversion system, discussing heat transfer processes for storage feasibility p0033 A70-41852
- Semiconductor solar energy converter, deriving conditions for occurrence of photoconductivity quenching p0034 A70-46325
- CdS-CuS n-p junction solar converters, noting longwave sensitivity dependence on light extrinsic absorption p0034 A71-11896
- Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft p0035 A71-27432
- Satellite solar power station for microwave generation, transmission and energy conversion to electrical power on earth p0035 A71-28665
- Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems p0035 A71-28666
- High efficiency and power long life cross field amplifier generator for solar energy conversion in space into microwave, discussing magnetron and amplifron p0035 A71-28668
- Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology p0036 A71-31671
- Reliability analysis of solar thermoelectric generator module as function of individual photocells, circuit design and redundancy p0036 A71-31672
- Photoeffect efficiency of solar energy converters based on semiconductor cadmium sulfide-copper sulfide heterojunctions p0036 A71-42536
- Satellite solar power stations, considering energy conversion, microwave generators and beam transfer to earth p0036 A72-11770
- High efficiency solar electricity converters utilizing wave-like properties of radiation interacting with absorber-converter elements, discussing cost and fabrication advantages [ASME PAPER 71-WA/SOL-1] p0036 A72-15891
- Pollution free electrical power generation from solar energy, discussing microwave transmission to earth, power shortages, thermal pollution and solar cell manufacture cost [ASME PAPER 71-WA/SOL-2] p0036 A72-15892
- Solar energy conversion as pollution-free power source, discussing silicon solar cells, power transmission techniques, satellite solar power stations and system control and guidance p0037 A72-18625
- American and European solar generator technology development review, discussing roll-up arrays, flexible panels, and stowage and deployment system components p0038 A72-28005
- Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response p0039 A72-30225
- Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation p0039 A72-35509
- A universal power characteristic of a high-temperature solar heat source p0039 A72-35516
- Parallel operation of the solar generator and battery on the Symphonie satellite p0039 A72-36681
- Technological evolution of solar generators for terrestrial applications and sounding balloons, discussing environment caused problems and solutions, energy cost estimate and future prospects p0042 A73-14253
- Satellite solar power station for solar energy conversion and transmission to earth via microwave beam, discussing technology status and weight and cost projections p0042 A73-18027
- Solar generator technology on the Symphonie satellite. p0042 A73-18976
- Solar cell generator technology development based on German AEROS satellite project and work on roll-up structure, discussing module concepts and test results p0042 A73-22439
- Satellite solar power station for solar energy conversion into electricity and transmission to ground receiving stations via microwave beams p0043 A73-22791
- Satellite solar power station systems engineering study, examining basic concept technical and economic feasibility p0043 A73-22814
- The feasibility of a satellite solar power station. p0045 A73-32718
- An analysis of linear focused collectors for solar power. p0046 A73-38409
- Thermoelectric and mechanical performance of silicon-germanium solar thermoelectric generator [NASA-CR-72300] p0046 N68-12252
- Six converter solar thermionic generator [NASA-CR-92586] p0046 N68-15766
- Testing, fabrication, configuration selection, and electrical performance calculations in solar thermionic generator development p0047 N68-16074
- Optimum Mariner spacecraft solar power system models [NASA-CR-95263] p0050 N68-27974
- Design techniques for solar generators based on silicon photovoltaic cells p0050 N68-28740
- Space environment simulation facilities for testing solar generator components, and test data application to solar generator design p0050 N68-28745
- Design and performance study of flat plate thermoelectric generators for solar probes [NASA-TN-X-52451] p0050 N68-31018
- Effect of boost environment on design of large area solar array, its release and deployment on ground and in space, and electrical power source analysis [NASA-CR-95999] p0051 N68-31404
- Fabrication feasibility and structural design of solar generators with array deployment and retraction capability [NASA-CR-97208] p0052 N68-36630

SUBJECT INDEX

SOLAR SENSORS

Transient solidification outside cooled pipe with application to solar Brayton heat receiver
[NASA-TN-D-4897] p0052 N69-10227

Six converter solar thermionic generator
[NASA-CR-98712] p0052 N69-14920

Solar paddle configuration for large astronomical satellite and available power
[ESRO-TN-P-5/ESTEC/] p0052 N69-15891

Power systems research reviews at Marshall Space Flight Center
p0215 N69-18068

Solar power conversion subsystems with load capability range from 200 to 500 W considered for advanced Nimbus missions
[NASA-CR-120529] p0053 N69-22175

Electron bombardment ion engine having 0.015 N thrust, 30 km/sec exhaust velocity, and 550 W deployable solar array proposed for Black Arrow X5 spacecraft
[RAE-TN-68191] p0054 N69-24137

Feasibility of construction and use of solar thermoelectric generators in India
[M7] p0054 N69-24313

Techniques for large scale solar energy conversion into electrical power
[JPRS-48222] p0054 N69-30038

Solar conversion power supply subsystem for Nimbus D satellite, and engineering tests
[NASA-CR-103418] p0055 N69-32305

Radiation damage on silicon solar cells - development of cadmium telluride and cadmium sulfide cells
p0055 N69-35592

Manufacturing and qualification testing of solar conversion power supply subsystem for Nimbus 4
[NASA-CR-106099] p0055 N69-38402

Mission analysis for solar electric propelled spacecraft on Mars Orbiter, Jupiter flyby, and asteroid belt exploration trajectories
[NASA-CR-106089] p0055 N69-38783

Photovoltaic cells for converting solar energy to electrical energy
p0056 N70-16228

Optimal systems for storage of solar energy after thermal conversion
p0056 N70-16229

Orbit parameter and constraint effects on solar generator design
p0057 N70-22507

Effectiveness analysis of thermal control system for HEAO
p0057 N70-22907

Systems engineering for preliminary criteria on HEAO power supply system and components
p0057 N70-22921

Energy conversion and electric power plants for developing countries
p0093 N70-38878

Design and testing of lithium fluoride cavity receivers for solar power conversion systems
[NASA-CR-54752] p0237 N70-42202

Technology and analytical techniques for development of solar power system for space stations
[NASA-CR-114828] p0060 N71-16462

Development and characteristics of lithium-doped solar cells
[NASA-CR-116220] p0060 N71-16472

Application of solar, nuclear, and chemical power systems for spacecraft power supplies
p0060 N71-19649

Feasibility of large-scale terrestrial plants for future generation of pollution free electrical power from solar energy
[NASA-TN-X-65497] p0061 N71-23700

Thermodynamics of honeycomb porous bed solar generators with and without fluid transpiration including generator designs
p0062 N71-28586

Mechanical, electrical, environmental, and launch simulation tests of Eole balloon solar generators
[NASA-TT-F-13836] p0063 N72-14032

Design, development, and evaluation of roll-up solar array rated at thirty watts per pound
[NASA-CR-128196] p0065 N72-32070

Reliability analysis of solar generator on ESRO 1 satellite
[NASA-TT-F-14498] p0065 N73-10051

Photoelectric solar converter using cadmium sulfide and cadmium selenide tablets or thin films
[AD-756594] p0067 N73-21960

Soviet research and development of solar batteries and power cells for spacecraft
[AD-756039] p0067 N73-21973

Analysis of methods for meeting national energy requirements with emphasis on technology for using solar energy
[NASA-TN-X-68230] p0067 N73-22748

State-of-the-art techniques for harnessing solar and wind power
[AD-765783] p0069 N73-33011

SOLAR HEATING

Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation
p0039 A72-35509

Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126

Feasibility of thermal energy storage and solar heating as means of conservation and more efficient utilization of electric power
[PB-210359] p0065 N73-10976

Technical and economic feasibility of solar powered space heating, air conditioning, and hot water heating systems for residential applications
[NASA-CR-124063] p0066 N73-17911

Solar heating and air conditioning as energy conservation alternatives to nuclear power
[NASA-TN-X-70468] p0022 N73-31990

SOLAR PROBES

Design and performance study of flat plate thermoelectric generators for solar probes
[NASA-TN-X-52451] p0050 N68-31018

Design and performance of solar array for Helios solar probe
[DGLR-PAPER-72-091] p0066 N73-15084

SOLAR RADIATION

Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941

Calculation of the solar radiation incident on an inclined ribbed surface
p0040 A72-43194

Analysis of silicon solar cells to show factors controlling blue response and methods for improvement
[NASA-CR-131090] p0066 N73-19059

Reliability analysis of thermoelectric module solar energy converter
[AD-757087] p0067 N73-23015

State-of-the-art techniques for harnessing solar and wind power
[AD-765783] p0069 N73-33011

Heliothermic conversion of solar radiation for industrial use
p0069 N73-33767

SOLAR REFLECTORS

Solar reflector mathematical model for studying interface between collector and heat receiver, noting error in cavity emitted radiation directional assumption
[AGARDOGRAPH 81] p0024 A68-22516

Faceted reflector for solar power installations with photoelectric converters, discussing reflector construction, efficiency and energy balance
p0027 A69-32798

SOLAR SENSORS

Passive sun trackers using solar energy activated bimetal helix thermal heliotrope
p0033 A70-34131

Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft
p0035 A71-27432

Thermal heliotrope adaptation to terrestrial applications, discussing solar radiation energy input dominance assurance and wind effect minimization
[ASME PAPER 71-WA/SOL-10] p0037 A72-15893

Passive solar array orientation devices for terrestrial application.
p0043 A73-22440

SOLAR SIMULATORS

SUBJECT INDEX

SOLAR SIMULATORS

Design and performance of two vacuum chambers and solar-radiation simulators for solar-cell research
[NASA-TM-X-1503] p0047 N68-16695
Lens assembly for solar furnace or solar simulator
[NASA-CASF-XNP-C4111] p0060 N71-15622

SOLDERING

Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126

SOLENOID VALVES

Proportional-integral control of reactants supply for hydrazine-oxygen fuel cells with pulse controlled solenoids
p0177 A72-18290

SOLENOIDS

Energy storage in superconducting short solenoid of circular cross sections
[LA-T6-70-9] p0265 N71-11913
Superconductors in marine technology, including coils, solenoids, and magnetic systems
[AD-755711] p0252 N73-22702

SOLID LUBRICANTS

Soviet Bloc research on petroleum refining and additive properties
[AD-706689] p0093 N70-35477

SOLID PROPELLANTS

Design of high temperature combustor for use as solid fuel MHD generator and thermodynamic analysis of combustion conditions
[AD-764153] p0254 N73-31848

SOLID SOLUTIONS

Solid solution oxide fuels for space electric power heat systems
[LA-DC-9686] p0264 N69-14302

SOLID STATE DEVICES

Microwave receiving antenna with solid state power rectifier for converting energy from space solar cell array into DC power on earth
p0035 A71-28671

SOLID STATE LASERS

Laser energy absorption by plasma for controlled thermonuclear fusion, comparing uses of electrically pumped gas, chemical and solid state lasers
p0187 A73-35379

SOLID-SOLID INTERFACES

High temperature solid-solid reactions and solid-liquid or condensed phase-gas equilibria, using solar furnace
p0032 A70-30907

SOLIDIFICATION

Transient solidification outside cooled pipe with application to solar Brayton heat receiver
[NASA-TM-D-4897] p0052 N69-10227

SOLVENT EXTRACTION

Pilot plant for solvent extraction of strontium 90 from fission products
[EUR-3613.F] p0078 N68-10864

SOUND WAVES

The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel
p0075 A73-12955

SOUTH AMERICA

Satellite-aircraft approach to oil detection and rock identification in North and South America
[NASA-CF-101384] p0084 N69-28160

SOUTHERN HEMISPHERE

Role monitoring of drifting buoys and balloons in Southern Hemisphere for oceanographic and meteorological data
[NASA-TT-R-14279] p0100 N72-25345

SPACE BASES

In-core 100 kwe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base
p0186 A73-26026

SPACE CHARGE

Radiation effects on Cs thermionic converter, discussing radiation interaction with alkaline atoms to complete space charge neutralization by supplementary ion creation
p0026 A69-29261

Electroquasidynamic energy converter load current analysis, deriving expression for space charge electric field with axially varying or constant charge distribution
p0165 A70-25036

SPACE ELECTRIC ROCKET TESTS

Kaufman electrical generator for use with solar cells in SERT 2 mission
p0023 A68-15882

Performance tests of flight worthiness of SERT array module
[NASA-CR-72706] p0058 N70-28421

SPACE ENVIRONMENT SIMULATION

Design and performance of two vacuum chambers and solar-radiation simulators for solar-cell research
[NASA-TM-X-1503] p0047 N68-16695
Space environment simulation facilities for testing solar generator components, and test data application to solar generator design
p0050 N68-28745

Tests of cadmium sulfide solar cells under simulated space environmental conditions
[NASA-CR-120840] p0063 N72-14029

SPACE ERECTABLE STRUCTURES

Design concept for rollout solar array configuration, discussing structural stability, power-to-weight ratio and analytical model
p0025 A68-42560

Deployment systems for extending large area lightweight flexible solar arrays in space, tabulating estimated design weights including power-weight ratios
p0031 A70-11932

Fabricating large solar array of thin silicon cells mounted on Kapton polyimide film with 560 W output
[RAE-TR-69007] p0060 N71-11063

Space erectable rollout solar array of arcuate solar panels furled on tapered drum for spacecraft storage during launch
[NASA-CASE-NPO-10188] p0061 N71-20273

Flexible rolled-up solar array module thermal cycling tests
[NASA-TM-X-52995] p0061 N71-21206

SPACE FLIGHT

Development of nuclear thermionic space power system using thermionic diodes, and heat pipe flow for temperature control
[NASA-TN-D-4299] p0200 N68-19146

Rankine cycle system studies for nuclear space power
[UCRL-70863] p0218 N69-23173

SPACE LABORATORIES

Power systems research reviews at Marshall Space Flight Center
p0215 N69-18068

SPACE MANUFACTURING

High temperature and vacuum solar furnace processing of refractory metals in space or on moon
p0039 A72-37675

Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126

SPACE POWER UNIT REACTORS

United States Space Nuclear Electric Power Program.
p0181 A72-45179

Unmanned reactor-thermoelectric systems for applications in the 1970's.
p0186 A73-26024

The Satellite Nuclear Power Station - An option for future power generation.
p0189 A73-38412

Principles, characteristics, and technology development status of conversion systems for converting reactor heat into space electric power
[NASA-TM-X-52472] p0004 N68-29921

Comparison of Brayton and Rankine cycle magnetohydrodynamic space power generation systems for use with nuclear heat source
[NASA-TN-D-5085] p0217 N69-20852

Nuclear reactors for electric power sources in space applications
p0226 N70-11305

System analysis of lithium-cooled Rankine cycle nuclear-electric space power unit
[NASA-TM-X-1919] p0226 N70-11975

Electrical power systems for earth orbiting missions
[AD-701352] p0233 N70-29518

Transfer functions for primary loop of conceptual nuclear Brayton space power plant
[NASA-TM-X-2193] p0240 N71-17933

SPACE PROGRAMS
Space applications research in astronomy and earth physics
[NASA-SP-331] p0021 N73-31867

SPACE SHUTTLE ORBITERS
H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report.
[IEEC PAPER 739028] p0116 A73-38436

SPACE SHUTTLES
Hydrogen-oxygen fuel cell technology for space shuttle electrical power requirements
p0237 N70-40974
Design and development of auxiliary power unit and air breathing propulsion system for space shuttle vehicle
p0095 N71-29603
Design and development of air breathing engine system for space shuttle vehicle
p0017 N71-29607

SPACE SIMULATORS
Electrical power distribution system and energy consumption during long duration operation of space station simulator
p0258 N71-20975

SPACE STATIONS
Microwave power transmission from orbiting solar power station to earth, discussing design optimization problems
p0035 A71-28666
High power linear beam tube devices for space power generation station, considering use of klystron with heat pipes for low weight and high efficiency
p0035 A71-28669
Hydrogen depolarized fuel cell for space station prototype carbon dioxide concentrator, describing modular design concept and operation
[ASME PAPER 71-AV-37] p0174 A71-36404
Configuration survey of lightweight solar array power systems for future missions.
p0043 A73-22782
Technology and analytical techniques for development of solar power system for space stations
[NASA-CR-114828] p0060 N71-16462
Electrical power distribution system and energy consumption during long duration operation of space station simulator
p0258 N71-20975
Space station solar array technology evaluation program
[MSC-07163] p0068 N73-30057

SPACEBORNE PHOTOGRAPHY
Geologic data acquisition from space-borne photography
p0088 N70-14088
Satellite monitoring of open pit mining operations
[BM-IC-8530] p0107 N73-24432

SPACECRAFT ANTENNAS
Low weight, integrated thermoelectric generator/antenna combination for spacecraft
[NASA-CASE-XER-09521] p0246 N72-12136

SPACECRAFT CABIN ATMOSPHERES
Hydrogen depolarized fuel cell for space station prototype carbon dioxide concentrator, describing modular design concept and operation
[ASME PAPER 71-AV-37] p0174 A71-36404

SPACECRAFT COMPONENTS
Improved technology for multiwatt radioisotope heater units.
p0188 A73-36681
Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems
[SAN-679-3] p0191 N68-10967
Soviet research and development of solar batteries and power cells for spacecraft
[AD-756039] p0067 N73-21973

SPACECRAFT CONSTRUCTION MATERIALS
Selection of materials and techniques for solar array design
[ESRO-CR-12] p0058 N70-30140

SPACECRAFT DESIGN

Spacecraft nuclear power source optimization, considering radioisotope and reactor heat sources, cryogenic cooler cycle types and spacecraft design
p0184 A73-22799
Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282] p0018 N72-13391

SPACECRAFT DOCKING
Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282] p0018 N72-13391

SPACECRAFT GUIDANCE
Operational properties and capabilities of spacecraft power sources for guidance and control
p0231 N70-22862

SPACECRAFT POWER SUPPLIES
Radioisotope power subsystems for space, examining performance, heat source design, power conversion methods and efficiencies
p0119 A68-10231
Optimal power conversion from solar array to spacecraft battery, obtaining power coupling by using high efficiency switching techniques
p0023 A68-17380
Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control
[AIAA PAPER 68-122] p0120 A68-17540
USAF Advanced Solar Turbo Electric Concept /ASTEC/ for space vehicle power requirements
p0023 A68-20595
Thin film solar cell materials, fabrication, structure and properties related to energy conversion efficiency in space applications
p0024 A68-20738
Solar cells for onboard spacecraft energy supply, discussing design, operation and power output of various cells
p0024 A68-33039
Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941
Cadmium sulfide thin film solar cell design for space applications
p0025 A68-42518
Single cell batteries with low input voltage conversion regulation considered as long life energy storage system, noting circuit integration
p0138 A68-42571
Liquid metal MHD power generation, discussing high magnetic Reynolds number direct AC induction generator, power cycles and operations
p0138 A68-42582
Solar energy storage optimization for satellite and space vehicle power systems, discussing thermal collection in heat sinks and electric batteries
p0261 A68-43812
Photovoltaic solar cell power technology application to space use and exploration
[ASME PAPER 68-WA/SOL-1] p0141 A69-16158
Nuclear power supply with in-core thermionic reactor for space power source and use in satellite TV, discussing theory, design and components
p0142 A69-20871
Astronautics - Conference, Braunschweig, West Germany, October 1968, Volume 2, Energy sources
p0147 A69-25862
Liquid-metal MHD space power generation system using intermittent vaporization slugs shooting at 2700 K peak temperature
p0149 A69-27492
Large solar array systems in space, discussing design and operation
p0027 A69-35056
Photovoltaic solar cell power technology application to space use and exploration
[ASME PAPER 68-WA/SOL-1] p0028 A69-36418

Deployment systems for extending large area lightweight flexible solar arrays in space, tabulating estimated design weights including power-weight ratios

p0031 A70-11932

Lewis Research Center applications of optics to research in flight propulsion and space power generation, discussing gas density visualization, radiative heat transfer, etc

p0032 A70-23522

Oriented flexible rolled-up solar array /FRUSA/ for spacecraft electric power generation, describing orientation and deployment mechanisms, solar panel, system operation, etc [AIAA PAPER 70-738]

p0032 A70-25434

Brayton, Hg, organic-Rankine and potassium-Rankine dynamic space power systems for use with nuclear energy sources

p0166 A70-29492

Solar arrays for Venus-Mercury flyby, evaluating temperature and power performance

p0033 A70-41010

Orbital mission solar energy power conversion system, discussing heat transfer processes for storage feasibility

p0033 A70-41852

Si solar cells lightweight economical deployable arrays, discussing temperature performance, assembly, coverslips, interconnection, stowage and telescopic mast and ends

p0034 A71-16099

Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystem

p0173 A71-30801

Incore thermionic reactor as low cost power supply for direct-to-home TV satellite, converting thermal power to electrical without moving masses

p0173 A71-32853

Rankine cycle turboelectric nuclear space power conversion system with liquid K as working fluid, discussing current technology status [GESP-623]

p0174 A71-33525

Electric power system for satellites, considering energy conversion, storage and processing from chemical, solar and nuclear sources

p0174 A71-34227

NASA space station electrical power systems discussing configurations, growth capacity, volume reliability and long term effects [AIAA PAPER 71-825]

p0174 A71-34720

Electrical power systems for spacecraft, reviewing solar cells, batteries, fuel cells and radioisotope thermoelectric generators

p0174 A71-37122

Multihundred watt radioisotope thermoelectric generator for spacecraft power supply, discussing system design, performance and safety requirements

p0176 A71-38927

Aerospace radioisotope power systems, discussing heat source technology, shielding, safety and thermoelectric integration [SAE AIR 1213]

p0176 A72-10387

Power supply and converters for satellite and spacecraft, discussing fuel cells, radioisotopes, nuclear reactors, etc

p0177 A72-16745

Kilowatt rotary dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics

p0178 A72-21414

Uranium mononitride as nuclear reactor fuel for space vehicle power supply applications, discussing fabrication techniques and irradiation behavior

p0074 A72-22406

Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies

p0038 A72-28034

Parallel operation of the solar generator and battery on the Symphonie satellite

p0039 A72-36681

Solar array cost reduction.

p0039 A72-37642

Design point characteristics of a 500 - 2500 watt isotope-Brayton power system.

[AIAA PAPER 72-1059] p0182 A73-13388

German book - New energy systems for space flight.

p0183 A73-17668

Solar generator technology on the Symphonie satellite.

p0042 A73-18976

Isotope Brayton space power systems and their technology.

p0183 A73-20467

Solar cell generator technology development based on German AEROS satellite project and work on roll-up structure, discussing module concepts and test results

p0042 A73-22439

Configuration survey of lightweight solar array power systems for future missions.

p0043 A73-22782

Spacecraft dynamic solar electric power/thermal control system with cold liquid flow and regenerator cooling for energy conversion efficiency and weight characteristics improvements

p0043 A73-22785

The Solar Collector Thermal Power System - Its potential and development status.

p0043 A73-22792

Spacecraft nuclear power source optimization, considering radioisotope and reactor heat sources, cryogenic cooler cycle types and spacecraft design

p0184 A73-22799

Brayton cycle solar dynamic turboalternator space electric power system technology developments during 1962-1972, considering power efficiency, components reliability and future missions

p0185 A73-25982

Concept for a high voltage solar array with integral power conditioning.

p0044 A73-26001

In-core 100 kWe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base

p0186 A73-26026

TRANSIT radioisotope thermoelectric generator technology, discussing structural design, thermal efficiency, performance prediction, panel configurations and life test data

p0186 A73-26034

Historical development of solar cells.

p0044 A73-29590

Solar array cost reductions.

p0044 A73-29592

Large area silicon solar array development.

p0044 A73-29593

Research plans for solar power in space.

p0044 A73-29594

Solar energy conversion development relative to Department of Defense space power requirements.

p0044 A73-29595

Long-life light weight reliable fuel cell development for long term space missions power supplies, describing system components and construction materials

p0044 A73-29596

The multi-hundred watt RTG - Technology background and flight systems program.

p0189 A73-38418

B2-02 auxiliary power unit for Space Shuttle

vehicles - A progress report.

[IECEC PAPER 739028] p0116 A73-38436

Fuel capsule vent system development for the Viking radioisotope thermoelectric generator.

p0077 A73-40766

High-efficiency converter and battery charger for an RTG power source.

p0190 A73-42906

Design and operational test data on SNAP, and nuclear reactor, conversion equipment, and spacecraft power systems technology

p0192 N68-12191

Review of electrochemical power sources for space systems and assessment of technology transfer possibilities

[NASA-TN-X-60795] p0263 N68-14818

SUBJECT INDEX

SPACECRAFT POWER SUPPLIES CONTD

- Annotated bibliography on batteries, fuel cells, thermionics, thermoelectrics, nuclear energy sources, and other direct energy conversion concepts adaptable to space vehicles
[NASA-TM-X-60877] p0195 N68-17223
- Colloquium on energy sources and energy conversion
[AGARDOGRAPH-81] p0195 N68-17793
- Heat transfer limitations in dynamic energy conversion systems for space power plants
p0195 N68-17797
- Working gas selection for closed Brayton cycle turbocompressor for space power applications
p0196 N68-17802
- Limitations of solar collectors and receivers for space applications
p0047 N68-17804
- Nonequilibrium electron mode for kilowatt range magnetoplasma dynamic generation of space power
p0197 N68-17812
- Electrothermal and thermal modes of regeneration in fuel cells for space power applications
p0199 N68-17825
- Satellite power supply control systems analysis of solar cell array battery
[ESRO-TM-54/ESTEC/1] p0047 N68-18466
- NASA educational facts on present and future electric power sources for space application
[NASA FACTS-NP-38] p0048 N68-19128
- Solar cells, radioisotope generators, fission electric cells, and thermionic converters considered for Jupiter spacecraft mission
p0201 N68-21480
- Design studies and efficiency evaluations for five spacecraft thermionic reactor systems
[REPT-68-007] p0201 N68-21856
- Geometric properties of expandable whirling membrane solar energy concentrator used in conjunction with electrical conversion systems for spacecraft auxiliary power units
[NASA-TN-D-4532] p0048 N68-22258
- Program review on critical areas of technology associated with solar cell battery power systems for manned spacecraft
[NASA-CR-94551] p0049 N68-23528
- Design and performance of photovoltaic power system on Nimbus 2 spacecraft
[NASA-CR-62045] p0202 N68-24455
- Performance of expandable whirling membrane solar energy concentrator for space power conversion
[NASA-TM-X-59872] p0049 N68-27564
- Optimum Mariner spacecraft solar power system models
[NASA-CR-95263] p0050 N68-27974
- Conference proceedings on performance predictions and technological developments for static energy conversion devices for space missions
[AGARD-CP-21] p0203 N68-28714
- Optimum design of spacecraft power supply systems using fuel cells, and characteristics of energy conversion methods
p0203 N68-28738
- Eight static and dynamic energy conversion systems for spacecraft power sources for future missions
p0203 N68-28748
- Radioactive isotopes as sources of heat and radiation with applications for spacecraft power and propulsion and terrestrial uses in SNAP
p0082 N68-30262
- Solar and radioisotope Brayton cycle power supplies
[NASA-TM-X-52438] p0051 N68-31096
- Parametric design data on canned ac induction motors for space nuclear electric power systems
[SAN-679-5] p0205 N68-31544
- Design, construction, and testing of preliminary 30 watts per pound roll-up solar array
[NASA-CR-96230] p0051 N68-32561
- SNAP 8 35 kW nuclear electric space power system
[NASA-TM-X-61161] p0264 N68-33238
- Space electrical power systems capable of meeting mission requirements
[NASA-R40-68-5] p0206 N68-35232
- Spacecraft power research and development
p0052 N68-37401
- Principle, production, and efficiency of silicon solar cells for spacecraft power supply
[RF-89-0] p0052 N69-11991
- Systems analysis of modular energy storage unit for improved reliability of battery power system
p0264 N69-12431
- Solid solution oxide fuels for space electric power heat systems
[LA-DC-9686] p0264 N69-14302
- Computer program for analysis of space power systems
[NASA-CR-73280] p0214 N69-14760
- Power systems research reviews at Marshall Space Flight Center
p0215 N69-18068
- Satellite power system configurations for maximum utilization of power
[NASA-CR-100038] p0053 N69-18748
- Solar power conversion subsystems with load capability range from 200 to 500 W considered for advanced Nimbus missions
[NASA-CR-100529] p0053 N69-22175
- Calorimetric evaluation of three 1.5-meter diameter inflatable rigidized solar concentrators for solar dynamic cycle power systems
[NASA-TN-D-5234] p0054 N69-28123
- Design and performance data of power subsystem in flight spacecraft Lunar Orbiter 3
[NASA-CR-100700] p0054 N69-29374
- Construction and evaluation for spacecraft use of hydrogen-oxygen fired thermionic generators and diodes
[NASA-CR-101745] p0222 N69-30871
- Solar conversion power supply subsystem for Nimbus D satellite, and engineering tests
[NASA-CR-103418] p0055 N69-32305
- Preliminary design and performance considerations for 25 kW Pu 238 heat source Isotope Reentry Vehicle
[NASA-CR-72555] p0223 N69-34989
- Liquid metal magnetohydrodynamic energy conversion cycles for spacecraft supply
[NASA-TM-X-63671] p0224 N69-37703
- Electrothermal instabilities effects on Brayton and Rankine cycle magnetohydrodynamic space power generation systems
[NASA-TN-D-5461] p0224 N69-37883
- Optimal shielding criteria for nuclear apparatus onboard spacecraft
p0224 N69-38756
- Space power systems lectures on sources and requirements
[ESRO-SP-45] p0226 N70-11301
- Solar, chemical, and nuclear energy as space power system primary energy sources
p0056 N70-11303
- Isotopic energy sources for space applications
p0226 N70-11304
- Description of solar conversion/energy storage power systems used on Transit 1B, 3B and 4B satellites
p0056 N70-12695
- Lecture series on energy conversion and systems engineering for space power sources
[AGARDOGRAPH-123-PT-1] p0228 N70-16217
- Nuclear electric power systems for space use
p0228 N70-16220
- Mechanical heat engines as energy conversion devices for space power generation
p0228 N70-16221
- Ac generators for converting mechanical to electrical energy for space power systems
p0228 N70-16224
- Electrochemical energy storage and electricity generation for space power sources
p0229 N70-16227
- Design of ESRO 1, ESRO 2, and HEOS A power systems and control equipment
[ESRO-TN-83] p0057 N70-17621
- Principles of operating magnetohydrodynamic power generators
p0229 N70-18728
- Controlled thermonuclear fusion for space power and propulsion
p0229 N70-18729
- Development of regenerator for use as Brayton cycle space power system using solar energy
[NASA-CR-108945] p0057 N70-20627
- Systems engineering for preliminary criteria on HEAO power supply system and components
p0057 N70-22921
- Spacecraft power supply design with emphasis on converter design
p0057 N70-24832

- Investigating technology for developing organic Rankine cycle power conversion system for space operation
[JAN-651-118] p0237 N70-37652
- Hydrogen-oxygen fuel cell technology for space shuttle electrical power requirements p0237 N70-40974
- Design and performance of cascaded thermoelectric generator
[NASA-CR-110877] p0238 N70-42733
- Development of integrated lightweight flexible silicon solar cell array
[NASA-CR-110913] p0059 N70-43081
- Fabricating large solar array of thin silicon cells mounted on Kapton polyimide film with 560 W output
[RAE-TR-69007] p0060 N71-11063
- Technology and analytical techniques for development of solar power system for space stations
[NASA-CR-114828] p0060 N71-16462
- Application of solar, nuclear, and chemical power systems for spacecraft power supplies p0060 N71-19649
- Pilot plant installation, and incore thermionic converter prototype for spaceflight use
[NASA-TT-F-13744] p0243 N71-35787
- Power and load priority control concept for Brayton cycle power system providing speed control and field current control for alternator and load simulation which includes energy storage
[NASA-TN-D-6478] p0244 N71-36452
- Cost effectiveness of solar cell space power systems
[NASA-TN-X-68054] p0063 N72-25022
- Utilization of neutron radiation from Pu02 decay to provide spacecraft electric power
[NASA-CR-127045] p0101 N72-26528
- Technical feasibility of improving efficiency of solar cells for space programs p0064 N72-27055
- Considerations, conclusions, and recommendations for improving efficiency of solar cells p0064 N72-27056
- Design of solar array simulators used in ground tests of spacecraft power supply systems p0064 N72-31077
- SPACECRAFT PROPULSION**
- Lewis Research Center applications of optics to research in flight propulsion and space power generation, discussing gas density visualization, radiative heat transfer, etc p0032 A70-23522
- Hydrogen resistojets for primary propulsion of communications satellites. p0009 A73-15741
- SPACECRAFT RELIABILITY**
- Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft p0035 A71-27432
- SPACECRAFT SHIELDING**
- In-core 100 kWe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base p0186 A73-26026
- Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector
[ASME PAPER 73-ENAS-7] p0045 A73-37969
- SPACECRAFT STABILITY**
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights
[NASA-SP-282] p0018 N72-13391
- SPACECRAFT STRUCTURES**
- Application of isotenoid flywheels to spacecraft energy and angular momentum storage
[NASA-CR-1971] p0266 N72-17020
- SPATIAL DISTRIBUTION**
- Higher spatial harmonics of magnetic field in induction magnetohydrodynamic generator p0194 N68-16289
- SPECIFIC HEAT**
- Thermodynamic characteristics of high temperature open cycles
[SM-74/235] p0212 N69-13345
- SPECTROMETERS**
- Correlation spectrometry from aircraft, balloons, and satellites applied to oil and mineral exploration and air pollution detection p0099 N72-23284
- SPECTROSCOPIC ANALYSIS**
- Electrical conductivity of plasma on magnetohydrodynamic generator, and spectroscopic analysis of argon and cesium plasma
[AD-703158] p0236 N70-36408
- SPECTRUM ANALYSIS**
- Nuclear geophysical techniques and spectral analysis in oil field exploitation and lithology
[SM-112/24] p0084 N69-30799
- SPECULAR REFLECTION**
- Methods for the quality control of the reflecting surfaces of solar energy condensers /Survey/ p0040 A72-43187
- SPLITTING**
- Splitting method of investigating strength properties of typical rocks in coal and shale deposits p0083 N69-21442
- SPONTANEOUS COMBUSTION**
- Differential equations for calculating factors causing spontaneous combustion in coal seams p0090 N70-16595
- SPOT WELDS**
- Solar cell array fabrication methods extending operating temperature by pulsed spot welding techniques and deletion of adhesives p0031 A70-12080
- SPREADING**
- Oil slick spreading on calm sea due to force of gravity and surface tension of water p0257 N70-10537
- SPRINGS (ELASTIC)**
- Switching mechanism with energy stored in coil spring
[NASA-CASE-XCS-00473] p0265 N70-38713
- STABILITY TESTS**
- Design, fabrication, and stability testing of foil gas bearing test rig
[NASA-CR-1563] p0231 N70-25623
- STABILIZERS (AGENTS)**
- Soviet book on automotive and jet aircraft engine fuel chemical stabilizers under storage, transit and operational conditions, examining additives in relation to stability ratings p0073 A71-17433
- STACKS**
- Prediction of effective stack height and corresponding ground level concentrations of effluents emitted from stack
[FNL-PUBL-71-14] p0098 N72-16934
- STAGNATION TEMPERATURE**
- MHD generator mounted at shock tube downstream used to obtain magnetically induced ionization, considering minimum initial equilibrium electron density p0126 A68-23120
- STANDARDS**
- Senate subcommittee hearings on air and water pollution, including data on air quality standards and gasoline additive developments p0016 N70-41771
- STAR TRACKERS**
- Thermal heliotrope adaptation to terrestrial applications, discussing solar radiation energy input dominance assurance and wind effect minimization
[ASME PAPER 71-WA/SOL-10] p0037 A72-15893
- STATIC INVERTERS**
- Series inverter silicon controlled rectifier 2800 watt dc power supply, noting high efficiency, low weight and stable voltage regulation p0176 A72-11064
- STATISTICAL ANALYSIS**
- Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000
[NLL-TRANS-1166-(9022.9)] p0096 N71-35501
- STATORS**
- Methane or hydrogen fuel direct cooling of first stage stator of SST aircraft turbine - numerical heat transfer analysis
[NASA-TN-D-6042] p0117 N70-42326

- STEAM**
Uranium fueled fast steam cooled reactors in SNEAK series
[EUPNR-608] p0085 N69-31161
- STEAM FLOW**
Injector characteristics using wet steam in connection with magnetohydrodynamic generator applications
[NASA-CR-97878] p0209 N69-13286
Catalytic and thermal reforming of gaseous hydrocarbons with steam into town gas
[NASA-TT-F-13668] p0095 N71-28159
- STEAM TURBINES**
Helicopter propulsion systems using closed cycle working fluid
p0218 N69-23998
- STEELS**
Magnetic systems using steel for magnetohydrodynamic generators
[AD-688393] p0224 N69-35280
- STELLARATORS**
Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings
[MATT-659] p0213 N69-23954
- STEREOCHEMISTRY**
The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.
p0076 A73-25465
- STOCHASTIC PROCESSES**
Minimal energy stochastic controller design for electrically driven vehicles, using dynamic programming
p0177 A72-17304
- STOICHIOMETRY**
Open cycle MHD generator operation, comparing below stoichiometric air-fuel ratios to excess air level
p0166 A70-39534
- STORAGE**
Algorithms for optimization of transportation and storage in petroleum industry
p0257 N68-14618
- STORAGE BATTERIES**
Gas tight lead storage battery with negative plates for oxygen absorption
p0262 A70-46352
Fuel cell-battery hybrid power source for electric vehicular propulsion
[AD-662234] p0194 N68-15712
Fuel cells and storage batteries for different types of energy conversion
[AD-696428] p0230 N70-21253
Spacecraft power supply design with emphasis on converter design
p0057 N70-24832
Analysis and breadboarded performance of parallel energy storage units for power systems
[NASA-CR-116516] p0266 N71-17471
- STORAGE STABILITY**
Storage stable, thermally activated foaming compositions for erecting and rigidizing mechanisms of thin sheet solar collectors
[NASA-CASE-LAR-10373-1] p0062 N71-26155
- STRATIFIED FLOW**
Striated flow induction synchronous MHD generator, producing striated flow by nonthermal ionization of inert seeded gas in electric field
p0145 A69-23487
- STRATIGRAPHY**
Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- STRATOSPHERE**
Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants
[JPRS-53174] p0016 N71-26623
- STRESS ANALYSIS**
Stress and materials analysis of Fiberglas epoxy composite flywheels used for short term energy storage
p0261 A68-12853
- STRETCH FORMING**
Calorimetric, optical, and vibration investigation of stretch-formed aluminum solar concentrators for thermionic converters
[NASA-TN-D-4889] p0052 N69-10708
- STRIATION**
Striated flow production in induction synchronous MHD generator by nonthermal ionization of inert seeded gas in generator internal electric field
p0128 A68-23931
- STRIP MINING**
Monitoring and evaluation of water quality, ice cover on Great Lakes, spread of crop viruses, and damage to strip mining areas
p0101 N72-29317
Ecological effects of strip mining in Ohio based on interpretation of ERTS-1 imagery
[E72-10069] p0101 N72-31353
Mapping ecological effects of coal strip mining in Ohio
[E72-10256] p0102 N73-12356
Strip mine identification, land use assessment, smoke plume detection, and sedimentation patterns in Sandusky Bay from ERTS-1 imagery of Ohio
[E72-10259] p0102 N73-12358
ERTS-1 imagery of landscape changes in Tennessee and Kentucky due to strip mining
[E72-10265] p0103 N73-12364
Detection and monitoring area strip mining and reclamation in Ohio using ERTS-1 imagery
[E72-10284] p0103 N73-13334
Environmental and ecological effects of coal strip mining in Ohio
[E73-10003] p0019 N73-15339
Ecological effects of coal strip mining in Ohio
[E73-10430] p0106 N73-20391
Satellite monitoring of open pit mining operations
[BM-IC-8530] p0107 N73-24432
Detection, monitoring, and mapping coal strip mining and reclamation in Ohio from ERTS-1 imagery
[E73-10641] p0107 N73-25338
ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386
ESEP imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337
Application of ERTS-1 imagery to determine ecological effects of strip mining in eastern Ohio
[PAPER-E2] p0109 N73-28266
Digital processing of ERTS-1 data for identification of strip mining areas in west branch area of Susquehanna River and mine drainage in Pennsylvania
[PAPER-E3] p0110 N73-28267
Digital analysis of ERTS-1 data to determine sedimentation levels in Potomac and Anacostia Rivers confluence and strip mining in Allegheny County, Maryland
[PAPER-E13] p0110 N73-28277
Mapping of strip mine areas in southeastern Ohio from ERTS-1 imagery
p0110 N73-28372
ERTS-1 imagery of landscape changes, strip mines, timber, agriculture, and water resources in eastern Tennessee
[E73-10843] p0110 N73-28421
Skylab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337
Usefulness of ERTS-1 MSS data for monitoring coal strip mining, detection of acid mine drainage, and determination of effectiveness of reclamation and abatement procedures in Pennsylvania
[E73-11112] p0112 N73-33269
- STRONTIUM 90**
Gisette 5 thermoelectric radioisotopic generator for submarine use, discussing strontium 90 as isotopic source
p0072 A69-38458
Pilot plant for solvent extraction of strontium 90 from fission products
[EUP-3613.F] p0078 N68-10864

- Strontium 90 heat source production, including purification, transportation, fuel form preparation, densification, and encapsulation [OFNL-11C-36] p0096 N71-35815
- STRUCTURAL ANALYSIS**
- Weight estimation and analysis of major structural components of hypersonic, liquid hydrogen fueled aircraft [NASA-TN-D-6692] p0118 N72-18911
- STRUCTURAL BASINS**
- Oil exploration in large intercratonic sedimentary basins in Oklahoma using ERTS-1 imagery [E73-10646] p0108 N73-25342
- STRUCTURAL DESIGN**
- Design concept for rollup solar array configuration, discussing structural stability, power-to-weight ratio and analytical model p0025 A68-42560
- Superconducting magnets for MHD generators, discussing design, construction and operation problems p0157 A69-39478
- Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies p0038 A72-28034
- Mechanized module technique for fabrication of heat resistant solar cell collectors and panels [RF-93-01] p0048 N68-22010
- Fabrication feasibility and structural design of solar generators with array deployment and retraction capability [NASA-CR-97208] p0052 N68-36630
- Design and construction of magnetogasdynamic plasma power generator in Canada p0216 N69-18447
- Design and performance of turbofan engines [AD-683118] p0220 N69-26520
- Automobile gas turbine engine design [AD-694842] p0227 N70-14488
- Design of multispectral scanner for orbital earth resources detection [NASA-CR-102111] p0089 N70-16407
- Orbit parameter and constraint effects on solar generator design p0057 N70-22507
- Conceptual designs for radioisotope electric power system [OFNL-TN-2366] p0233 N70-29364
- Design and performance of roll-up solar array engineering model p0061 N71-22561
- Design parameters of noble gas magnetohydrodynamic generator for nuclear power plant [JNL-706-TP] p0242 N71-27918
- Conference of structural design principles and mechanical engineering methods for aerospace mechanisms used in orbital and space flights [NASA-SP-282] p0018 N72-13391
- Design of low cost terrestrial photovoltaic power system using solar array [NASA-CR-127031] p0064 N72-26034
- Design and performance of one wavelength magnetohydrodynamic liquid flow induction generator [NASA-CR-127891] p0249 N72-30655
- Optimal design of baseline configuration for solar array panel with deployable beam [NASA-CR-130287] p0066 N73-15079
- Design of solar energy concentrators with concentric circular seams of plastic films [AD-755829] p0067 N73-21712
- Design and cost estimate of high altitude wind power plant [NASA-TT-F-14903] p0107 N73-23011
- STRUCTURAL PROPERTIES (GEOLOGY)**
- Utilization of ERTS-1 imagery for mapping large scale structural lineaments in Precambrian Shield and basins containing younger sediments and for mineral and petroleum exploration [E73-10004] p0104 N73-15340
- ERTS-1 imagery of geosstructures of Alaskan continental crust and relation to mineral resources [E73-10321] p0105 N73-18353
- Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas [E73-10474] p0105 N73-20376
- ERTS-1 imagery of structural and lithological properties of Northern Coast Ranges and Sacramento Valley, California [E73-10478] p0107 N73-21315
- Commercial utility of ERTS-1 imagery in structural reconnaissance of Precambrian Shield for minerals and petroleum [E73-10523] p0107 N73-23414
- Application of Skylab EREP imagery to fracture-related mine safety hazards and environmental problems in mining [E73-10802] p0109 N73-27277
- Identification of geosstructures of continental crust in Alaska and relation to mineral resources and exploration [E73-11035] p0112 N73-31339
- Oil exploration using ERTS-1 imagery of lithology and geological structures [E73-11053] p0112 N73-32229
- STRUCTURAL STABILITY**
- Design concept for rollup solar array configuration, discussing structural stability, power-to-weight ratio and analytical model p0025 A68-42560
- STRUCTURAL VIBRATION**
- Structural analyses on space vehicle insulation, solar panels, and temperature sensor responses p0057 N70-22865
- STRUCTURAL WEIGHT**
- Deployment systems for extending large area lightweight flexible solar arrays in space, tabulating estimated design weights including power-weight ratios p0031 A70-11932
- Solar thermoelectric generator /STEG/ with two stage converter, discussing weight factors and efficiency p0032 A70-32425
- Configuration survey of lightweight solar array power systems for future missions, p0043 A73-22782
- Development of a lightweight body-mounted solar cell array with a high power to weight ratio, p0046 A73-38408
- SUBASSEMBLIES**
- Selection of materials and techniques for solar array design [ESRO-CR-12] p0058 N70-30140
- SUBMARINES**
- Cisete 5 thermoelectric radioisotopic generator for submarine use, discussing strontium 90 as isotopic source p0072 A69-38458
- Incore thermionic reactor application to meet European TV broadcasting satellite and submarine and underwater laboratory power requirements p0181 A72-36166
- SUBSONIC FLOW**
- NASA-Lewis closed loop MHD low temperature power generator, describing systems performances during subsonic tests p0165 A70-25614
- SUBSTRATES**
- Design criteria for integrated lightweight flexible silicon solar cell arrays [NASA-CR-106379] p0056 N69-40952
- Method and apparatus for fabricating solar cell panels [NASA-CASE-XNP-03413] p0062 N71-26726
- SULFIDES**
- Petroleum sulfides advantageous effect on oxygen consumption during combustion p0072 A69-19456
- SULFUR**
- Hydration method for determination of sulfur in petroleum [NSTIC/13106/67] p0079 N68-15630
- Use of lithium/sulfur batteries as load-leveling devices in electrical utility networks [ANL-7958] p0268 N73-30058
- SULFUR OXIDES**
- NASA technologies considered for application to sulfur dioxide problem of air pollution [NASA-CR-100629] p0013 N69-39189
- Investigating petroleum products for capacity to absorb sulfur dioxide from industrial waste gases [MRL-RTS-5464] p0091 N70-20779
- Control techniques for sulfur oxide air pollutants [PB-190254] p0015 N70-34670

- SUMMER**
Problems of room heating in summer - suitable building materials p0059 N70-30560
- SUPERCONDUCTING MAGNETS**
Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity p0120 A68-16523
Large superconducting magnets for MHD power plants, discussing scale-up requirements, cryogenic system, stable operation margin and emergency system shutdown p0122 A68-20175
Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity p0131 A68-30774
Superconducting magnets for MHD generators, discussing design, construction and operation problems p0157 A69-39478
Electrical DC collector machines and MHD magnetic systems design using superconductors, describing models p0173 A71-32274
Paramagnetic cycles for low temperature superconducting magnet cooling, discussing refrigerator, cryogenic pumps, regenerators and adjustable heat source and sink p0176 A71-40898
Superconducting magnetic systems reliability engineering and design, noting combined conductors for uncontrolled transition prevention in normal state under subcritical currents p0182 A73-10616
Rotating electrical machine superconducting field winding design requirements in terms of size, magnetic energy storage, power level, rotation speed and pole number p0182 A73-11828
Superconducting magnet ac generators development, emphasizing conversion efficiency, manufacturing, relative costs, machine geometry and interwinding coupling factor effects p0182 A73-11833
Engineering problems in the design of controlled thermonuclear reactors. [AIAA PAPER 73-259] p0182 A73-16980
Large-scale applications of superconducting coils. p0183 A73-20107
Optimal, elliptic and circular windings for superconducting nonferrous magnetic MHD generators, comparing cross sections p0185 A73-24594
Applications of superconductivity. p0187 A73-34111
Transient processes in superconducting magnets in MHD generators [SM-74/229] p0212 N69-13341
Superconducting magnet of niobium-titanium and copper composite for use in controlled thermonuclear fusion research [UCRL-71010] p0218 N69-22640
Loss rate and capital costs of storing energy in superconducting coils [DLR-FB-72-10] p0267 N72-26656
MHD parameter optimization procedure for determining optimum coil geometry for 10 MW level superconducting magnet system [AD-745322] p0250 N73-11717
Redesign of Argas 2 facility for using superconducting magnet [NASA-TT-F-14876] p0252 N73-22662
- SUPERCONDUCTIVITY**
Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. p0182 A73-11826
Research and development of superconducting magnetic systems for MHD generators using Nb-Ti alloys [AD-706779] p0237 N70-37715
Status of MHD power generators and related technology in Japan [AD-727094] p0244 N71-38510
Problems and applications of superconductive energy storage [NASA-TT-F-15109] p0268 N73-31676
- SUPERCONDUCTORS**
Energy storage possibilities of superconductors, and use of dielectric materials [CEA-R-3243] p0263 N68-15938
Theoretical and experimental studies of energy storage and transfer in cryogenics and magnetohydrodynamics [NAFL-31] p0207 N68-37342
Energy storage in superconducting short solenoid of circular cross sections [LA-TR-70-9] p0265 N71-11913
Energy storage and release capabilities of superconductors at high power [NASA-TT-F-13585] p0266 N71-23515
Inductive magnetic energy storage with superconductors or cryogenic aluminum conductors [LA-DC-12990] p0267 N72-17829
Development of superconducting magnet system for magnetohydrodynamic power generation [AD-745321] p0249 N73-10247
- SUPERCritical FLOW**
Thermodynamic analysis of supercritical mercury heat engine and magnetohydrodynamic generator [AE-355] p0224 N69-35785
- SUPERCritical PRESSURES**
Thermodynamic parameters of MHD cycle employing supercritical Hg, indicating need for more suitable fluids p0156 A69-31914
- SUPERSONIC AIRCRAFT**
Supersonic aircraft fuel technical requirements p0094 N70-39640
Preliminary appraisal of hydrogen and methane fuel and fuel tank configuration in Mach 2.7 supersonic transport [NASA-TM-X-68222] p0020 N73-22711
- SUPERSONIC COMBUSTION RAMJET ENGINES**
Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0072 A68-44975
Scramjet engine active cooling with regenerative system using superalloy heat exchangers and hydrogen fuel as coolant [AIAA PAPER 68-1091] p0115 A69-43725
Potentials and problems of hydrogen fueled supersonic and hypersonic aircraft. p0009 A73-22830
- SUPERSONIC FLOW**
Linear nonequilibrium shock tunnel driven supersonic MHD generator operation under large scale power extraction and strong electromagnetic- rare gas interactions p0172 A71-29879
Comparison of ASTM-A1 liquid fuel and natural gas fuels in annular turbojet combustor at Mach 3 [NASA-TM-X-52700] p0087 N70-12102
- SUPERSONIC NOZZLES**
Gas dynamics of supersonic radial nozzles for magnetohydrodynamic generators [FTD-MT-24-206-67] p0206 N68-35663
Injector characteristics using wet steam in connection with magnetohydrodynamic generator applications [NASA-CR-97878] p0209 N69-13286
Experimental results on two phase supersonic nozzle used in liquid metal magnetohydrodynamic generators [NASA-CR-97877] p0209 N69-13287
- SUPERSONIC TRANSPORTS**
Liquid methane fuel substitution for kerosene in supersonic transport, discussing engine performance, aircraft design and cost reduction p0072 A68-84446
SST aircraft fuels and lubricants, discussing fire hazard and pollution minimization p0073 A70-29999
Economically viable and socially acceptable second-generation SST, discussing technological developments for range/payload, airport noise and sonic boom improvements [AIAA PAPER 73-15] p0009 A73-17608
Tankage systems for methane-fueled supersonic transport [NASA-TM-X-1591] p0081 N68-23895
Fuel considerations for commercial supersonic transport aircraft [AD-696588] p0117 N70-18542

SURFACE COOLING

SUBJECT INDEX

SURFACE COOLING

Aerodynamic problems in cooled turbine blading design for small gas turbine engines p0220 N69-26532

SURFACE DEFECTS

Direct solar radiation concentration by paraboloid mirrors, analyzing energy transport and distribution functions, based on statistically distributed imperfections of reflecting surfaces p0030 A70-10762

SURFACE FINISHING

Solar installations optical properties selectivity increase by light-collecting surfaces mechanical treatment, describing plate grinding with abrasive powders p0031 A70-19625

SURFACE LAYERS

Evaluation of solar mirror surface materials by ATS 3 reflectometer p0061 N71-25311

SURFACE PROPERTIES

Selective surfaces and coatings for solar energy conversion systems, discussing semiconductor photoconverters, white-black surfaces, cooling systems and optimal optical properties p0037 A72-24315

Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings [NASA-TT-F-116591] p0048 N68-22401

Magnetohydrodynamic flow, surface properties, silicon solar cells, and thermoelectric properties of graphite compounds p0223 N69-34812

Development of surfaces and coatings for solar energy conversion systems [NASA-TT-F-146500] p0066 N73-15598

SURFACE VEHICLES

Liquid hydrogen as future replacement for hydrocarbon fuels in surface and air transportation, noting advantages in energy per unit weight and pollution-free combustion p0115 A71-44365

State of the art in gas turbine design for automobile application [PUBL-18] p0227 N70-13927

SURFACTANTS

Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films. [WSCI PAPER 72-271] p0075 A73-16687

SURVEYS

Literature survey of materials for gaseous thermionic conversion systems for use in space [NASA-TM-X-2130] p0238 N71-11689

SUSPENSIONS

Gaseous suspensions of thermionic emitting particles assessed as MHD working fluids in large scale MHD electric power generators p0146 A69-23491

SUSQUEHANNA RIVER BASIN (MD-WY-PA)

Digital processing of ERTS-1 data for identification of strip mining areas in west branch area of Susquehanna River and mine drainage in Pennsylvania [PAPER-E3] p0110 N73-28267

SWEDEN

Management planning in Sweden for natural gas as industrial energy source [IVA-MEDD-167] p0096 N71-30522

SWITCHES

Switching mechanism with energy stored in coil spring [NASA-CASE-XGS-00473] p0265 N70-38713

SWITCHING CIRCUITS

Optimal power conversion from solar array to spacecraft battery, obtaining power coupling by using high efficiency switching techniques p0023 A68-17380

SYMBOLIC PROGRAMMING

EQUICORE - space dependent code written in FORTRAN 4 assessing nuclear and thermal performance in reactors [TRG-1608] p0230 N70-22307

SYMPHONIE SATELLITES

Parallel operation of the solar generator and battery on the Symphonie satellite p0039 A70-36681

Solar generator technology on the Symphonie satellite, p0042 A73-18976

SYNCHRONOUS COMMUNICATIONS SATELLITE PROJ

Possible space application of incore thermionic reactor particularly for direct television broadcasting [EMBW-FB-W-70-16] p0233 N70-30407

SYNCHRONOUS SATELLITES

Structural design, performance and costs of rigid or semirigid solar panels for geostationary satellites power supplies p0038 A72-28034

Synchronous satellite solar power station for solar energy conversion to microwaves for transmission to earth discussing technical, economic and social aspects [ASME PAPER 72-WA/SOL-6] p0042 A73-15801

Near-equatorial synchronous orbit Satellite Solar Power Station system with photovoltaic cell arrays energy conversion into microwave power for transmission to earth p0043 A73-23601

SYSTEM EFFECTIVENESS

Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass envelope improvement [AIAA PAPER 73-710] p0045 A73-36331

Electrolytic hydrogen fuel production with solid polymer electrolyte technology. p0116 A73-38413

SYSTEM FAILURES

Hot spot failure modes in solar cell arrays noting protection through I-V characteristic control p0028 A69-42273

Failure data handbook for nuclear power facilities - failure category identification and glossary [LMEC-NEMO-69-7-VOL-2] p0234 N70-31812

SYSTEMS ANALYSIS

Study, cost, and systems analysis of present and projected liquid hydrogen production [NASA-CR-73226] p0011 N68-28227

Principles, characteristics, and technology development status of conversion systems for converting reactor heat into space electric power [NASA-TM-X-52472] p0204 N68-29921

Parameter analysis of electric power distribution and conditioning systems of Rankine type space nuclear power plants [NAED-67-45E] p0206 N68-32748

System analysis of lithium-cooled Rankine cycle nuclear-electric space power unit [NASA-TM-X-1919] p0226 N70-11975

Design and performance of cascaded thermoelectric generator [NASA-CR-110877] p0238 N70-42733

Analysis of magnetoplasmadynamic converters [AEC-TR-71611] p0239 N71-15010

Operating characteristics of large nonequilibrium MHD generator with cesium seeded noble gases and heated electrodes [AD-719381] p0241 N71-24680

Magnetohydrodynamic generator systems analysis including electrical impedance and power conversion efficiency calculations for various designs p0241 N71-26449

Construction and tests of MHD generator channel and electrical power converter [AD-758783] p0253 N73-25106

SYSTEMS COMPATIBILITY

Development of cesium seeding techniques, large MHD magnets, plasma diagnostic techniques, and thermionic electrodes compatible with shock tube MHD generators [AD-711351] p0238 N71-10992

SYSTEMS ENGINEERING

Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity p0120 A68-16523

Thermodynamics and design of open and closed cycle MHD energy conversion generators emphasizing end effects, Hall effects, heat transfer and aerodynamic losses [AGARDOGRAPH 81] p0123 A68-22530

SUBJECT INDEX

SYSTEMS ENGINEERING CONTD

- Fuel cell system performance related to reactant properties, tabulating values for cell design factors
[AGARDOGRAPH 81] p0125 A68-22541
- Tests with pulse MHD generator with superconducting magnets concerning magnetic inductance distribution and field intensity
p0131 A68-30774
- Cadmium sulfide thin film solar cell design for space applications
p0025 A68-42518
- Design and performance equations for panel type solar thermoelectric generator, based on single thermocouple as generator unit
p0026 A69-15675
- Thermionic energy converter theory and efficiency, discussing design considerations to improve performance
p0142 A69-18255
- Nuclear power supply with in-core thermonuclear reactor for space power source and use in satellite TV, discussing theory, design and components
p0142 A69-20871
- Cold hydrogen and basic electrolyte cells at CGE research center, discussing single cell batteries, reagent chambers and auxiliary control systems
p0115 A69-21039
- Liquid flow MHD alternating current generator design, considering induced current in rotor and resulting magnetic field in pole gap
p0149 A69-27495
- Single wavelength design with compensation compared to multiwavelength design without compensation for liquid metal MHD induction converter, discussing optimization
p0150 A69-27504
- Primary isotope thermionic electric power module design, considering various assemblies
p0155 A69-29190
- Soviet research on thermionic energy conversion, advantages and applicability in various fields
p0156 A69-29279
- MHD generator design with electric conductivity waveform at small magnetic Reynolds numbers
p0156 A69-29911
- Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides-fabrication, costs, etc
p0028 A69-35708
- Superconducting magnets for MHD generators, discussing design, construction and operation problems
p0157 A69-39478
- Radioisotope thermoelectric generators /RTG/ design and performance analysis method applied to generators using Si-Ge Air-Vac type thermocouples
p0161 A69-42260
- Commercial thermoelectric generator design, applications and economics compared to batteries and small MG sets
p0165 A70-25033
- Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc
p0165 A70-25525
- Design requirements for solar cells and arrays as function of illumination, orbit, geometry and type of stabilization, space environment, etc
p0032 A70-29554
- Thermoelectric generators design for space and remote terrestrial sites, discussing fuel source, conversion section, heat rejection, etc
p0167 A70-39225
- MHD induction generator design, considering electrical and friction loss measurement and control
p0167 A70-39988
- Reliable brushless direct-drive system design for controlling position and rate of solar power arrays on orbiting spacecraft
p0035 A71-27432
- Electrical DC collector machines and MHD magnetic systems design using superconductors, describing models
p0173 A71-32274
- Multihundred watt radioisotope thermoelectric generator for spacecraft power supply, discussing system design, performance and safety requirements
p0176 A71-38927
- Thermal heliotrope adaptation to terrestrial applications, discussing solar radiation energy input dominance assurance and wind effect minimization
[ASME PAPER 71-WA/SOL-10] p0037 A72-15893
- NASA closed cycle MHD facility for power generation, discussing system components, design and operation
[AIAA PAPER 72-103] p0177 A72-16936
- American and European solar generator technology development review, discussing roll-up arrays, flexible panels, and stowage and deployment system components
p0038 A72-28005
- Optimized 100 We multicell thermionic power supply design with high reliability, noting isomeric converter performance characteristics
p0180 A72-34583
- Design point characteristics of a 500 - 2500 watt isotope-Brayton power system.
[AIAA PAPER 72-1059] p0182 A73-13388
- Silicon solar cell design, describing handbook organization and derivation of design curves and data tables
p0040 A73-14209
- Satellite solar power station systems engineering study, examining basic concept technical and economic feasibility
p0043 A73-22814
- Long-life light weight reliable fuel cell development for long term space missions power supplies, describing system components and construction materials
p0044 A73-29596
- Modern control techniques applied to energy conservation flight control systems.
p0263 A73-38415
- Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems
[SAN-679-3] p0191 N68-10967
- Design concepts for planetary solar array
[NASA-CR-91730] p0046 N68-14185
- Design criteria for Rankine magnetohydrodynamic generators in space applications
[NASA-TM-X-52191] p0200 N68-19019
- Optimum design of spacecraft power supply systems using fuel cells, and characteristics of energy conversion methods
p0203 N68-28738
- Design techniques for solar generators based on silicon photovoltaic cells
p0050 N68-28740
- Parametric design data on canned ac induction motors for space nuclear electric power systems
[SAN-679-5] p0205 N68-31544
- Analytical data for electric power system components in advanced high temperature potassium Rankine nuclear space power systems
[CONF-680802-1] p0206 N68-34481
- Design, manufacture, and testing of parasitic load resistors for Brayton power conversion system
[NASA-CR-72436] p0208 N69-10335
- Problems in operating MHD generator installation
[SM-74/221] p0212 N69-13336
- Design and construction of magnetogasdynamic plasma power generator in Canada
p0216 N69-18447
- Satellite power system configurations for maximum utilization of power
[NASA-CR-100038] p0053 N69-18748
- Design of magnetohydrodynamic induction machine with end poles which produce compensating magnetic fields
[NASA-CASE-XNP-07481] p0218 N69-21929
- Rankine cycle system studies for nuclear space power
[UCRL-70863] p0218 N69-23173
- Lecture series on energy conversion and systems engineering for space power sources
[AGARDOGRAPH-123-PT-1] p0228 N70-16217
- Thermionic converter development status from viewpoint of prospective engineering use
p0229 N70-16226

SYSTEMS MANAGEMENT

SUBJECT INDEX

- Systems engineering for preliminary criteria on
HEAO power supply system and components
p0057 N70-22921
- Design and testing of lithium fluoride cavity
receivers for solar power conversion systems
[NASA-CR-54752] p0237 N70-42202
- Development of cesium seeding techniques, large
MHD magnets, plasma diagnostic techniques, and
thermionic electrodes compatible with shock tube
MHD generators
[AD-711351] p0238 N71-10992
- Literature survey of materials for gaseous
thermionic conversion systems for use in space
[NASA-TM-X-2136] p0238 N71-11689
- Engineering aspects of magnetohydrodynamics
p0241 N71-26458
- Modular design of out-of-core nuclear thermionic
power conversion system
[NASA-TM-X-68049] p0247 N72-23675
- Steel construction design parameters for building
and operating ZYKLON type wind driven power plants
[NASA-TT-P-14872] p0106 N73-21253
- Design of repetitively pulsed inductive energy
storage systems
[AD-755359] p0267 N73-23014
- Functional characteristics and operating data of
experimental, aerodynamic three-phase electric
power plant constructed in Crimea
[NASA-TT-P-14933] p0107 N73-24268
- Design of MHD generators with fuel gas and air
turbine
[JUL-892-TP-VOL-11] p0254 N73-30699
- Portable open cycle fuel cell power plant capable
of operation on military fuels
[AD-764285] p0254 N73-30979
- SYSTEMS MANAGEMENT**
- Applicability of NASA contract quality management
and failure mode effect analysis procedures to
USGS Outer Continental Shelf oil and gas lease
management program
[NASA-TM-X-2567] p0100 N72-25955

T

TABLES (DATA)

- Fuel cell system performance related to reactant
properties, tabulating values for cell design
factors
[AGARDOGRAPH R1] p0125 A68-22541
- Commercial aviation gasolines inspection data
tabulated and compared for 1969 and 1964
[SAE PAPER 700228] p0073 A70-25897
- Tables summarizing Si solar cell fabrication
parameters, complex design evolution and
performance achievement
p0040 A73-14204
- Mineral yearbook containing domestic industry data
[PB-214329/51] p0108 N73-25411
- TANKER SHIPS**
- Air-cushion tankers for transporting Alaskan North
Slope oil
[NASA-TM-X-2683] p0258 N73-18981
- Problems and prospects for marine transportation
of oil
[NASA-CR-133854] p0258 N73-30464
- TAYLOR INSTABILITY**
- Rayleigh-Taylor instability in synchronous liquid
metal MHD generators, showing stabilization by
channel positioning and threshold power rating
p0150 A69-27508
- TECHNICAL WRITING**
- Cumulative bibliography of research and
development projects conducted on heat pipe
technology and applications
[NASA-CR-135953] p0258 N73-33900
- TECHNOLOGICAL FORECASTING**
- Cost goals for silicon solar arrays for large
scale terrestrial applications.
p0041 A73-14250
- Technological evolution of solar generators for
terrestrial applications and sounding balloons,
discussing environment caused problems and
solutions, energy cost estimate and future
prospects
p0042 A73-14253

- Civil transport aircraft future design trends,
discussing subsonic, supersonic, hypersonic and
V/STOL aircraft, engine design, fuels and noise
reduction
p0076 A73-23682
- TECHNOLOGIES**
- Social quantitative benefit vs risk assessment of
new technologies, considering atomic power safety
p0007 A71-12120
- Review and description of transferable
technologies to near future
[PB-178271] p0011 N68-31703
- Development of relationship between consumption of
energy by technological processes and second law
of thermodynamics
[NASA-TM-X-65912] p0019 N72-26971
- TECHNOLOGY ASSESSMENT**
- Electrical power systems for spacecraft, reviewing
solar cells, batteries, fuel cells and
radioisotope thermoelectric generators
p0174 A71-37122
- Aerospace radioisotope power systems, discussing
heat source technology, shielding, safety and
thermoelectric integration
[SAE AIR 1213] p0176 A72-10387
- Silicon solar cell fabrication technology
developments for long mission life performance
reliability over wide temperature and radiation
intensity ranges
p0038 A72-28029
- United States Space Nuclear Electric Power Program.
p0181 A72-45179
- Tables summarizing Si solar cell fabrication
parameters, complex design evolution and
performance achievement
p0040 A73-14204
- Solar array and supporting technologies
development, discussing manufacturing, handling,
design qualification tests in space environment
and comparison between fold-up and roll-up types
p0041 A73-14237
- Fabrication criteria, mission design factors and
I-V characteristics of Li solar cells
p0041 A73-14242
- Technological evolution of solar generators for
terrestrial applications and sounding balloons,
discussing environment caused problems and
solutions, energy cost estimate and future
prospects
p0042 A73-14253
- Economically viable and socially acceptable
second-generation SST, discussing technological
developments for range/payload, airport noise
and sonic boom improvements
[AIAA PAPER 73-15] p0009 A73-17608
- Air breathing hypersonic aircraft technology
developments in propulsion systems and
structures with emphasis on use of hydrogen fuel
[AIAA PAPER 73-58] p0009 A73-17631
- Solar generator technology on the Syphonie
satellite.
p0042 A73-18976
- Solar cell generator technology development based
on German AEROS satellite project and work on
roll-up structure, discussing module concepts
and test results
p0042 A73-22439
- Isotope Brayton electric power system for the 500
to 2500 watt range.
p0184 A73-22793
- Satellite solar power station systems engineering
study, examining basic concept technical and
economic feasibility
p0043 A73-22814
- AEC/NASA thermionic reactor program with emphasis
on technology utilization, comparing with
French, German and Soviet programs
p0184 A73-22815
- Thermionic fuel elements for in-core reactor power
plant space applications, summarizing operating
and environmental requirements and technology
development
p0076 A73-22819
- Laser energy transfer - An analytic survey of high
power applications.
p0257 A73-22822

SUBJECT INDEX

TECHNOLOGY UTILIZATION

- Energy 70; Proceedings of the Fifth Intersociety Energy Conversion Engineering Conference, Las Vegas, Nev., September 21-25, 1970. Volumes 1 & 2. p0185 A73-25976
- Brayton cycle solar dynamic turboalternator space electric power system technology developments during 1962-1972, considering power efficiency, components reliability and future missions p0185 A73-25982
- Concept for a high voltage solar array with integral power conditioning. p0044 A73-26001
- Solar array cost reductions. p0044 A73-29592
- Research plans for solar power in space. p0044 A73-29594
- The utilization of solar energy to help meet our nation's energy needs. p0045 A73-32193
- Power plants, cost estimates, freighter missions, commercial feasibility and technology for nuclear air cushion vehicles p0187 A73-32194
- Market trends and technical progress in small gas turbine engines for general aviation and executive aircraft and helicopters p0187 A73-34447
- Electric power generation on earth via satellite solar power station, assessing technologies of energy collection and conversion, microwave transmission and rectification p0045 A73-35313
- Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass envelope improvement [AIAA PAPER 73-710] p0045 A73-36331
- Electrolytic hydrogen fuel production with solid polymer electrolyte technology. p0116 A73-38413
- The multi-hundred watt RTG - Technology background and flight systems program. p0189 A73-38418
- Development of technology for fabricating and integrating solar cell array into deployable systems [NASA-CR-112002] p0063 A72-13046
- Review and evaluation of solar array technology [NASA-CR-128533] p0065 A72-33057
- Solar array development discussing manufacturing, design qualification tests in aerospace environments, and comparison between fold-up and roll-up types [BAE-TX-72109] p0067 A73-21959
- Space station solar array technology evaluation program [MSC-07163] p0068 A73-30257
- Fabrication techniques for lithium-doped silicon solar cells [AD-764357] p0068 A73-30982
- TECHNOLOGY TRANSFER**
- The impact of aerospace technology on energy conversion in the 70's. [ASME PAPER 72-AERO-11] p0008 A72-43147
- TECHNOLOGY UTILIZATION**
- Cost analysis of liquid hydrogen for aircraft fuel, considering production methods, plant capacity and technological advances p0001 A68-33457
- MHD technology applications to industry and cost and performance of MHD generators p0139 A69-11394
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1] p0141 A69-16158
- Large solar array systems in space, discussing design and operation p0027 A69-35056
- Photovoltaic solar cell power technology application to space use and exploration [ASME PAPER 68-WA/SOL-1] p0028 A69-36418
- NERVA reactor technology applied to closed Brayton cycle MHD power system [AIAA PAPER 70-1225] p0170 A70-45956
- Electrical power generation from sunlight without pollution, using solar cell elevated rug technology p0034 A71-16100
- Si solar cell technology, discussing contacts, low temperature performance and conversion efficiency p0034 A71-16103
- Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma p0176 A71-38949
- Thermal heliotrope adaptation to terrestrial applications, discussing solar radiation energy input dominance assurance and wind effect minimization [ASME PAPER 71-WA/SOL-10] p0037 A72-15893
- Power generation for electrical, thermal and transportation needs, considering technology use for air, noise, thermal, water and nuclear pollution reduction p0037 A72-18627
- Electric power generation by thermionic converters, discussing physical principles of operation and technology utilization in communications, meteorology, geophysics, oceanography and space exploration p0181 A72-39940
- Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications. [ASME PAPER 72-AERO-12] p0181 A72-43148
- Commercial space applications economics, discussing meteorological, navigational traffic control and communications satellites, nuclear waste disposal, space manufacturing, solar power generation, etc p0009 A72-45216
- Applied Superconductivity Conference, 5th, Annapolis, Md., May 1-3, 1972, Proceedings. p0182 A73-11826
- Fuel cells for improved electrical power supply. [AIAA PAPER 73-82] p0183 A73-17641
- Large-scale applications of superconducting coils. p0183 A73-20107
- AEC/NASA thermionic reactor program with emphasis on technology utilization, comparing with French, German and Soviet programs p0184 A73-22815
- Laser energy transfer - An analytic survey of high power applications. p0257 A73-22822
- Applications of superconductivity. p0187 A73-34111
- Feasibility of satellite solar power station technology concepts, discussing cost analysis, energy conversion efficiency, weight, space environment and microwave transmission p0046 A73-39247
- Hydrazine and methanol fuel cells comparison with hydrogen-air cells in terms of fuel costs and conversion efficiency, considering electric generators and automotive applications p0116 A73-45025
- Review and screening of defense and space oriented technology applicable to urban transportation problems [PB-178272] p0011 N68-31690
- Contributions of NASA sponsored programs dealing with electroforming, Ni-Cd-Zn-Ag batteries, refractory alloys, fuel cells, solar cells, and stress corrosion in titanium alloys [NASA-CR-96813] p0011 N68-34388
- Fast-breeder reactors as heat sources for nuclear electric power generation based on NASA-DERIVED technology p0012 N69-12576
- Space Rankine cycle power systems technology applied to ground-based power systems p0208 N69-12577
- Gas turbine engine principles, performance improvements, and application to electric power generation based on NASA technology p0208 N69-12578
- NASA derived direct energy conversion processes for possible utilization by electric power industry p0208 N69-12585
- Conference summary - selected NASA technology in electric power industry utilization p0012 N69-12586
- Results from US&EC plutonium utilization programs conducted by Battelle-Northwest [BNWL-SA-2065] p0082 N69-15237

- NASA technologies considered for application to sulfur dioxide problem of air pollution
[NASA-CR-106629] p0013 N69-39189
- Economic utilization of nuclear power plants in chemical and industrial centers
p0014 N70-14506
- Technological improvements for reducing costs of solar cells and solar arrays
[NASA-TM-X-68035] p0063 N72-21033
- Conceptual design, component assembly, feasibility tests, and evaluation of advanced fuel cell technology
[NASA-CR-115572] p0247 N72-23053
- Fuel cell technology program to advance state-of-the-art of hydrogen oxygen fuel cells using P and WA PCB technology
[NASA-CR-128519] p0249 N72-30029
- Design and utilization of fuel and electric cells and heat engines
[AD-743651] p0249 N72-33065
- Utilization of space technology to supply earth demands for thermal and electric energy
p0019 N73-13864
- Technologies for production and utilization of petroleum, natural gas, oil shale and coal
[BM-IC-8612] p0111 N73-30335
- TELEVISION SYSTEMS**
- Possible space application of incore thermionic reactor particularly for direct television broadcasting
[BMW-FB-W-70-16] p0233 N70-30407
- TELEVISION TRANSMISSION**
- Incore thermionic reactor as low cost power supply for direct-to-home TV satellite, converting thermal power to electrical without moving masses
p0173 A71-32853
- TEMPERATURE CONTROL**
- Radioisotope heater as heat source for maintaining silver-zinc battery temperatures in low ambient environment
p0261 A68-25659
- Solar arrays for Venus-Mercury flyby, evaluating temperature and power performance
p0033 A70-41010
- Spacecraft dynamic solar electric power/thermal control system with cold liquid flow and regenerator cooling for energy conversion efficiency and weight characteristics improvements
p0043 A73-22785
- Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector
[ASME PAPER 73-ENAS-7] p0045 A73-37969
- Development of nuclear thermionic space power system using thermionic diodes, and heat pipe flow for temperature control
[NASA-TN-D-4299] p0200 N68-19146
- Effectiveness analysis of thermal control system for HERO
p0057 N70-22907
- TEMPERATURE DISTRIBUTION**
- Thermoelectric power generator with variable thermal conductivity and electrical resistivity, obtaining steady state temperature distribution, power output and thermal efficiency
p0157 A69-00131
- Incore thermionic cell power output limitation and thermal/electrical data determination at steady state operation, considering temperature distribution
p0172 A71-25894
- Gas velocity and temperature distribution effects on electrical parameters of Faraday-type MHD generator
[INR-1045] p0235 N70-33547
- TEMPERATURE EFFECTS**
- Chemical power conversion to mechanical or electrical energy noting relation to temperature limits of heat for heat engine
p0123 A68-20734
- Electrode and boundary layer temperature effects on combustion driven MHD generator, discussing generator configuration
p0126 A68-23911
- Electrode and boundary layer temperature effects on MHD generator performance, investigating energy transfer from working fluid to external load
p0132 A68-39715
- Solar cells and solar cell generators as spacecraft power supplies, noting particle radiation and temperature effects and generator structure
p0025 A68-41941
- Collector temperature influence on maximum efficiency of thermionic converter in series battery
p0025 A68-43817
- Solar cell characteristics at low temperatures, noting efficiency increase with decreasing temperature
p0027 A69-35691
- Solar cell for improved performance during extreme temperature fluctuations, discussing wraparound contact
p0031 A70-16724
- Liquid metal MHD conservation cycles, discussing evolution and status of power generation at various temperatures
p0167 A70-39325
- Performance comparison of diagonal conducting wall MHD generator and Hall generator of equal dimensions, investigating wall temperature effect
p0169 A70-40004
- High pressure ratio centrifugal compressors for small gas turbine engines, investigating power and specific fuel consumption variation with pressure and temperature
p0172 A71-24218
- Optimal conditions for energy conversion in MHD generator, observing ion seeding effect on plasma temperature
p0177 A72-11207
- Proposed stratigraphic controls on the composition of crude oils reservoir in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- Compression temperature and pressure effects on ignition and cool flame decay of hydrocarbons in stoichiometric proportions with air
p0080 N68-19175
- Radiation damage and temperature dependence data on silicon solar cell arrays
p0050 N68-28741
- Electrode temperature effect on MHD generator performance
[AD-683793] p0220 N69-27071
- TEMPERATURE GRADIENTS**
- Temperature drop in combustion chamber of open cycle MHD power plant due to added potassium carbonate as function of various parameters
p0140 A69-14162
- Natural isotopic distribution studies for evaluation of new hydrocarbon deposits
[SK-112/27] p0085 N69-30801
- TEMPERATURE MEASUREMENT**
- Solar radiant energy distribution pattern and temperature in focus of parabolic cylinder concentrator constructed of plane mirror elements
p0025 A68-41092
- Heat conversion coefficients and initial temperature of active elements of solar powered electric devices
p0151 A69-28314
- Temperature measurement of products in solar furnace by IR pyrometers, considering interference filters, reflections parasitic effects, etc
p0032 A70-32424
- Temperature measurements and thermal energy potential of deep boreholes in petroleum-bearing regions of Ukraine
p0090 N70-16587
- TEMPERATURE PROFILES**
- Viscosity-temperature chart for hydrocarbons permitting linear extrapolations into low viscosity high temperature regions
p0072 A69-23975
- TEMPERATURE SENSORS**
- Structural analyses on space vehicle insulation, solar panels, and temperature sensor responses
p0057 N70-22865
- TENNESSEE**
- BRTS-1 imagery of landscape changes in Tennessee and Kentucky due to strip mining
[E72-10265] p0103 N73-12364

SUBJECT INDEX

THERMAL ENERGY

- Geographic applications of ERTS-1 imagery to rural landscape change in Tennessee
[E72-10355] p0103 N73-14343
- Geographic analysis and mapping of landscape changes in Tennessee from ERTS-1 imagery
[E73-10661] p0108 N73-25357
- ERTS-1 imagery of strip mining activity in Cumberland Plateau, Tennessee Test Site and agricultural areas in Alabama, Georgia, and Tennessee
[E73-10694] p0108 N73-25386
- ERTS-1 imagery of landscape changes, strip mines, timber, agriculture, and water resources in eastern Tennessee
[E73-10843] p0110 N73-28421
- TENSILE STRENGTH**
Splitting method of investigating strength properties of typical rocks in coal and shale deposits
p0083 N69-21402
- TEST EQUIPMENT**
Test apparatus and technique for assessing Peltier thermoelectric cooling device operational characteristics
p0178 A72-27721
- Thermionic converters performance and life tests, discussing test equipment and diffusion effect on emitter stability
p0180 A72-36139
- Experimental equipment and testing methods for electrofluid dynamic energy conversion
p0198 N68-17818
- TEST FACILITIES**
Closed cycle MHD experimental facility characteristics, discussing seeding, Faraday and Hall voltage measurements and plasma conductivity
p0127 A68-23929
- Test facility and performance predictions for Rankine cycle power system components, including lithium heater, potassium boiler, condenser and preheater
[GESP-451] p0173 A71-32223
- Space environment simulation facilities for testing solar generator components, and test data application to solar generator design
p0050 N68-28745
- Test facility for combustion flow in open cycle magnetohydrodynamic generator
[AD-751251] p0251 N73-16036
- TESTING TIME**
Thermoelectric panel array of hybrid thermocouples with p-type Si-Ge encapsulated PbTe/Si-Ge n-legs, presenting performance test results as function of test time
p0184 A73-22766
- TEXAS**
Utilization of ERTS-1 imagery in structural reconnaissance for minerals and oil in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[E73-10414] p0105 N73-20376
- Commercial application of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392
- Application of ERTS-1 imagery to determine geological evidence of mineral and hydrocarbon accumulations in Alaska, Canada, Montana, Colorado, New Mexico, and Texas
[PAPER-G30] p0109 N73-28261
- THERMAL ABSORPTION**
Solar absorptances and spectral reflectances of metals
[NASA-TN-D-5353] p0055 N69-31895
- Direct thermal energy conversion using thermal absorption principle
[NASA-CASE-ARC-10461-1] p0252 N73-20931
- THERMAL CONDUCTIVITY**
Thermal contacts effects on optimum operating conditions of solar thermoelectric power generator, discussing losses due to low thermal conductivity coefficient of insulating layers
p0027 A69-32797
- Thermoelectric power generator with variable thermal conductivity and electrical resistivity, obtaining steady state temperature distribution, power output and thermal efficiency
p0157 A69-40131
- THERMAL CONDUCTORS**
Thermal response of bimetal thermostat solar array orientation device
p0063 N72-13396
- THERMAL CONTROL COATINGS**
Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector
[ASME PAPER 73-ENAS-7] p0045 A73-37969
- THERMAL CYCLING TESTS**
Feasibility of 30 watts per pound roll-up solar array - design of engineering demonstration model with deployability of selected flight configuration and thermal cycling tests of array
[NASA-CR-94243] p0048 N68-21879
- Design, manufacture, and testing of parasitic load resistors for Brayton power conversion system
[NASA-CR-72436] p0208 N69-10335
- Flexible rolled-up solar array module thermal cycling tests
[NASA-TM-X-52995] p0061 N71-21206
- THERMAL DIFFUSION**
Thermionic converters performance and life tests, discussing test equipment and diffusion effect on emitter stability
p0180 A72-36139
- Thermal diffusion of materials, magnetoplasma studies, and electrochemical processes for purpose of energy conversion by unconventional techniques
[NASA-CR-97473] p0207 N69-10111
- Facility for uranium enrichment by thermal diffusion
[NP-18173] p0093 N70-37298
- THERMAL ENERGY**
Plasma heating by fast hydromagnetic wave, measurements of diamagnetic pressure determine efficiency for RF power conversion into thermal energy
p0122 A68-19482
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0131 A68-31227
- Thermally regenerative Li-Sn cell with immobilized fused salt electrolyte, discussing current density-voltage curves for various operating conditions
p0137 A68-42517
- Electroquasidynamic generator for direct conversion of moving dielectric medium potential or thermal energy to electric power
p0140 A69-14153
- Solar energy absorbers and thermal storage devices for high temperature energy conversion to electric power by thermionic or thermoelectric method
p0030 A70-10764
- Thermal or chemical energy conversion to electromagnetic radiation by laser, discussing atomic or molecular processes and thermodynamic limitations
p0176 A71-38939
- MHD power generator for converting heat into electricity by interacting magnetic field with flowing electrically conducting fluid
p0176 A71-40020
- Geothermal energy extraction from hot rocks via deep dry wells by pressurized water circulation, solving numerically fluid flow, heat transport and rock fracture equations
p0075 A73-16382
- The Solar Collector Thermal Power System - Its potential and development status.
p0043 A73-22792
- Thermal energy storage by utilizing heats of fusion for suitable materials
p0263 N68-17798
- Increased thermal efficiency and increased Diesel engine size economics
[REPT.-1] p0081 N68-24990
- General principles and theories on direct conversion of chemical, nuclear, thermal, or solar energy into electrical or mechanical power
[FTD-MT-64-355] p0203 N68-26786
- Energy conversion efficiency of thermal and electric regenerative fuel cells
p0203 N68-28735

THERMAL EXPANSION

SUBJECT INDEX

- Eight static and dynamic energy conversion systems for spacecraft power sources for future missions
p0203 N68-28748
- Radioactive isotopes as sources of heat and radiation with applications for spacecraft power and propulsion and terrestrial uses in SNAP
p0082 N68-30262
- Problems in operating MHD generator installation [SM-74/221]
p0212 N69-13336
- Mixed fission products potential as thermal and gamma energy sources [BNWL-1115]
p0224 N69-38506
- Potential applications of nuclear explosives to recover geothermal energy [USGS-289-1]
p0088 N70-12921
- Transactions on Soviet mining thermophysics, and economics of extracting and using thermal energy sources
p0089 N70-16584
- Artificial circulation system for heat transfer from subsurface porous layers by underground boilers
p0089 N70-16585
- Thermal water resources in Transcarpathin region of Ukraine
p0090 N70-16586
- Temperature measurements and thermal energy potential of deep boreholes in petroleum-bearing regions of Ukraine
p0090 N70-16587
- Filtration of heat carriers in earth core rocks at depths from 6 to 8 kilometers
p0090 N70-16588
- Cost analysis for geothermal boiler installation for mining thermal heat sources
p0090 N70-16590
- Direct conversion of thermal energy into electrical energy using crossed electric and magnetic fields [NASA-CASE-XLE-0212]
p0235 N70-34134
- Concentrator device for controlling direction of solar energy onto energy converters [NASA-CASE-XLE-01716]
p0059 N70-40234
- Storage stable, thermally activated foaming compositions for erecting and rigidizing mechanisms of thin sheet solar collectors [NASA-CASE-LAB-18373-1]
p0062 N71-26155
- Utilization of space technology to supply earth demands for thermal and electric energy
p0019 N73-13864
- Direct thermal energy conversion using thermal absorption principle [NASA-CASE-ARC-10461-1]
p0252 N73-20931
- Deep-seated thermal processes, social-economic heat utilization, and geothermal observation improvement [JPRS-59496]
p0109 N73-27324
- THERMAL EXPANSION**
Large area Si solar cell arrays design, considering environment, cell layout, thermal expansion, coverslides fabrication, costs, etc
p0028 A69-35708
- A solar engine using the thermal expansion of metals.
p0046 A73-38473
- THERMAL INSULATION**
Thermal contacts effects on optimum operating conditions of solar thermoelectric power generator, discussing losses due to low thermal conductivity coefficient of insulating layers
p0027 A69-32797
- Thermoelectric-couple life tests and efficiency measurements at constant thermal input, noting insulation for limiting parasitic heat losses [ASME PAPER 69-WA/ENER-14]
p0163 A70-14896
- Performance characteristics and limitations of electrode and insulation materials for open and closed cycle MHD generators, noting ceramic compositions for channel
[AD-737019]
p0178 A72-22401
- THERMAL POLLUTION**
Heat transfer research review, discussing gas turbines, aeronautics, astronautics, nuclear power, thermal pollution and controlled fusion challenges
p0178 A72-23684
- Thermal mapping at electrical power generating sites for outfall from fossil or nuclear fuel plants, considering airborne application
p0076 A73-33360
- Gas core reactors and MHD generator to solve problems of growing demand for electric power without thermal pollution
p0243 N71-33664
- THERMAL RADIATION**
Thermal activity of the Uson Caldera based on infrared and photographic aerial survey.
p0077 A73-39895
- THERMAL REACTORS**
Unmanned reactor-thermoelectric systems for applications in the 1970's.
p0186 A73-26024
- Program for assessment of natural uranium consumption of different types of thermal reactors [RISO-M-684]
p0082 N68-33991
- THERMAL RESISTANCE**
Ceramics replacement for Ni-Cr superalloys to improve automotive gas turbine performance by increasing inlet temperature, considering material selection
p0187 A73-31250
- THERMAL STABILITY**
Hydrocarbon fuel for hypersonic vehicle cooling, discussing use of endothermic reactions to achieve maximum heat sinks [AIAA PAPER 68-997]
p0072 A68-45023
- High efficiency Cu2S-CdS-solar cells with improved thermal stability.
p0041 A73-14216
- Microsurface thermal stability of astronomical mirrors fabricated from aluminum alloy with chromium and nickel coatings [NASA-TT-P-11659]
p0048 N68-22401
- Electron temperature instabilities in entrance region of magnetohydrodynamic generator [NASA-TN-X-1761]
p0217 N69-20875
- Performance test on rollup solar array system and thermal bending tests on deployable boom [NASA-CR-118006]
p0061 N71-23714
- Flight testing of cadmium sulfide thin film solar cells for stability and efficiency [AD-723315]
p0062 N71-31939
- THERMAL STRESSES**
Solar generator technology on the Symphonie satellite.
p0042 A73-18976
- THERMALIZATION (ENERGY ABSORPTION)**
Feasibility of power by nuclear fusion [ORNL-TN-2204]
p0204 N68-30162
- THERMIONIC CATHODES**
MHD generator cathode current-sheath voltage characteristics for thermionic arc spot emission mode, noting role of cathode temperature [ASME PAPER 69-WA/HT-51]
p0163 A70-14797
- Physical model for behavior of thermionic arc spots on MHD generator cathode [NASA-TN-D-5414]
p0224 N69-35732
- THERMIONIC CONVERTERS**
Efficiency limitations of solar energy collectors and receivers as converters in space applications [AGARDGRAPH 81]
p0024 A68-22525
- One wave induction MHD converter performance advantages over uncompensated multiwave converter balanced by friction losses and inductive power requirements
p0128 A68-23932
- Molecular chemistry, statistical mechanics and plasma physics principles for theoretical output current and efficiency characteristics of vapor thermionic converters
p0130 A68-29729
- Book on direct energy conversion covering fuel cells, thermionic and thermoelectric systems, radiation cells, fusion plasma and other MHD generators
p0132 A68-36891
- Materials limitations and problems for direct energy conversion methods of thermoelectricity, solar cells, thermionics and fuel cells
p0133 A68-41217
- Collector temperature influence on maximum efficiency of thermionic converter in series battery
p0025 A68-43817

- Thermionic energy converter theory and efficiency, discussing design considerations to improve performance p0142 A69-18255
- Radiation effects on Cs thermionic converter, discussing radiation interaction with alkaline atoms to complete space charge neutralization by supplementary ion creation p0026 A69-29261
- Laboratory device for investigating thermionic energy converters and measuring current-voltage characteristics by static/dynamic methods p0156 A69-34700
- Book on direct energy conversion principles and methods covering fusion, fuel cells, MHD, thermoelectric, thermionic, photovoltaic, electrohydrodynamic, piezoelectric and ferroelectric power generation p0171 A71-11193
- Quasi-vacuum mode thermionic converter for space and remote terrestrial power supplies, describing computer codes for design optimization p0172 A71-25899
- Soviet book on thermionic and MHD energy conversion covering gas ionization, converter operation and low temperature plasma physics p0172 A71-26099
- German monograph on thermionic power supply equipment converter network reliability covering I-V characteristics and failure probability calculation p0177 A72-15696
- Output performance of a thermionic converter with an oriented tungsten /110/ emitter and a polycrystalline tungsten collector. p0180 A72-34604
- Thermionic converters performance and life tests, discussing test equipment and diffusion effect on emitter stability p0180 A72-36139
- Tb 228 decay from short and long term simulation tests of thorium dioxide heat source in thermionic energy converter with W capsule p0075 A72-36162
- State of development of an actinium fueled thermionic generator. p0075 A72-36169
- Thermionic converters efficiency in commercial power generation applications, considering lifetime, reliability and cost p0181 A72-36192
- Electric power generation by thermionic converters, discussing physical principles of operation and technology utilization in communications, meteorology, geophysics, oceanography and space exploration p0181 A72-39940
- Plasma core reactor and inductive magnetohydrodynamic converter for power generating system [DLR-FB-67-59] p0191 N68-11139
- Six converter solar thermionic generator [NASA-CR-92586] p0046 N68-15766
- Nuclear source limitations for direct conversion systems p0196 N68-17803
- Thermodynamic properties of thermionic emitters, electron collectors, and ionization and excitation of gas in interelectrode spaces of thermionic energy converters p0196 N68-17805
- Performance and life test on thermionic converters and generators [NASA-CR-94154] p0201 N68-21597
- Fabrication and test performance of solar thermionic collector-radiator heat pipe structure [NASA-CR-94402] p0048 N68-22991
- Computer program and mathematical model for calculating performance characteristics of solar thermoelectric energy conversion plate [NASA-CR-94615] p0049 N68-23987
- Calorimetric, optical, and vibration investigation of stretch-formed aluminum solar concentrators for thermionic converters [NASA-TN-D-4889] p0052 N69-10708
- Six converter solar thermionic generator [NASA-CR-98712] p0052 N69-14920
- All metal thermionic nuclear module [CEA-CONF-1041] p0218 N69-24985
- Magnetohydrodynamic power generator development for commercial application p0221 N69-28597
- Thermoelectric, thermionic, and Brayton conversion devices for radioisotopic power generators [AD-687131] p0223 N69-32804
- Vacuum thermionic converter with short-circuited triodes and increased electron transmission and conversion efficiency [NASA-CASE-XLE-01015] p0225 N69-39898
- Electrical isotopic generator in milliwatt range [CEA-R-3834] p0225 N69-40586
- Basic converter physics and thermionic reactor design indicating role of electron energy loss reduction in converter [AD-699944] p0232 N70-26434
- Fundamental processes occurring in thermionic energy converters related to overall converter performance [AD-700945] p0232 N70-26947
- Combining thermionic converter with solar cell in solar power array [AD-704002] p0059 N70-36227
- Literature survey of materials for gaseous thermionic conversion systems for use in space [NASA-TN-X-2130] p0238 N71-11689
- Manufacturing processes for production of solar cells p0060 N71-17248
- Development and characteristics of solar cells with phosphors in cover glass to improve response to solar ultraviolet radiation [NASA-CASE-ARC-10950] p0062 N71-33409
- pilot plant installation, and incore thermionic converter prototype for spaceflight use [NASA-TT-P-13744] p0243 N71-35787
- Measurements of plasma parameters in simulated thermionic converter with cesium plasma for spacecraft use p0245 N72-10852
- Basic physical processes in thermionic and magnetohydrodynamic converters of thermal energy into electrical energy [AD-748707] p0250 N73-13061
- THERMIONIC DIODES**
- Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control [AIAA PAPER 68-1221] p0120 A68-17540
- Development of nuclear thermionic space power system using thermionic diodes, and heat pipe flow for temperature control [NASA-TN-D-4299] p0200 N68-19146
- Construction and evaluation for spacecraft use of hydrogen-oxygen fired thermionic generators and diodes [NASA-CR-101745] p0222 N69-30871
- THERMIONIC EMISSION**
- Gaseous suspensions of thermionic emitting particles assessed as MHD working fluids in large scale MHD electric power generators p0146 A69-23491
- Thermionic emission characteristics of W and Mo subjected to focused CW carbon dioxide laser radiation, discussing direct energy conversion p0162 A70-12068
- THERMIONIC EMITTERS**
- Thermionic reactor technology, including insulator seal, nuclear fuel, emitter, tri-layer structure and interelectrode plasma p0176 A71-38949
- Output performance of a thermionic converter with an oriented tungsten /110/ emitter and a polycrystalline tungsten collector. p0180 A72-34604
- Development of cesium seeding techniques, large MHD magnets, plasma diagnostic techniques, and thermionic electrodes compatible with shock tube MHD generators [AD-711351] p0238 N71-10992
- THERMIONIC POWER GENERATION**
- Thermionic power generation, discussing neutralization and unignited and ignited modes of thermionic converters p0119 A68-12962
- Thermionic generator power system using reactor heat source connected to external thermionic diodes by heat pipes, noting reactor control [AIAA PAPER 68-1221] p0120 A68-17540

THERMOCHEMICAL PROPERTIES

SUBJECT INDEX

Thermionic generator space power system using solar energy thermionic /SET/ diode array and incandescent radioisotope fuel block radiant heat source
p0128 A68-24403

Molecular chemistry, statistical mechanics and plasma physics principles for theoretical output current and efficiency characteristics of vapor thermionic converters
p0130 A68-29729

Direct energy conversion and materials limitations, discussing thermoelectricity, solar cells, thermionics and fuel cells
p0140 A69-11801

Nuclear power supply with in-core thermionic reactor for space power source and use in satellite TV, discussing theory, design and components
p0142 A69-20871

Electrical testing of six converter solar energy thermionic generator, discussing overheating and dual current mode anomalies
p0026 A59-21823

Thermionic electrical power generation - Conference, Stresa, Italy, May 1968
p0152 A69-29172

Primary isotope thermionic electric power module design, considering various assemblies
p0155 A69-29190

SNAP 13 generator designs to develop technology for isotope heated thermionic converters, describing tests, efficiencies, power outputs and life times
p0155 A69-29191

Soviet research on thermionic energy conversion, advantages and applicability in various fields
p0156 A69-29279

Rankine cycle technology concerning high temperature, refractory alloy and liquid metal experience, showing applicability to nuclear Brayton and thermionic power systems
p0163 A70-12513

Incore thermionic cell power output limitation and thermal/electrical data determination at steady state operation, considering temperature distribution
p0172 A71-25894

Incore thermionic reactor as low cost power supply for direct-to-home TV satellite, converting thermal power to electrical without moving masses
p0173 A71-32853

German monograph on thermionic power supply equipment converter network reliability covering I-V characteristics and failure probability calculation
p0177 A72-15696

Optimized 100 We multicell thermionic power supply design with high reliability, noting isomite converter performance characteristics
p0180 A72-34583

Thermionic energy conversion with a Pa-Cs-diode.
p0180 A72-34603

Incore thermionic reactor application to meet European TV broadcasting satellite and submarine and underwater laboratory power requirements
p0181 A72-36166

State of development of an actinium fueled thermionic generator.
p0075 A72-36169

Thermionic converters efficiency in commercial power generation applications, considering lifetime, reliability and cost
p0181 A72-36192

AEC/NASA thermionic reactor program with emphasis on technology utilization, comparing with French, German and Soviet programs
p0184 A73-22815

Thermionic fuel elements for in-core reactor power plant space applications, summarizing operating and environmental requirements and technology development
p0076 A73-22819

In-core 100 kWe thermionic power system design to meet manned spacecraft shielding requirements, discussing waste heat removal and integration with space base
p0186 A73-26026

Development of a plutonium-fueled miniature power supply based on thermionic conversion.
p0186 A73-26028

Russian book - Physical bases of thermionic energy conversion.
p0190 A73-41876

Testing, fabrication, configuration selection, and electrical performance calculations in solar thermionic generator development
[NASA-CR-92520]
p0047 N68-16074

Thermionic and photovoltaic energy conversion
p0200 N68-21052

Performance and life test on thermionic converters and generators
[NASA-CR-94154]
p0201 N68-21597

Design studies and efficiency evaluations for five spacecraft thermionic reactor systems
[REPT.-68-007]
p0201 N68-21856

Principles, characteristics, and technology development status of conversion systems for converting reactor heat into space electric power
[NASA-TM-X-52472]
p0204 N68-29921

Construction and evaluation for spacecraft use of hydrogen-oxygen fired thermionic generators and diodes
[NASA-CR-101745]
p0222 N69-30871

Thermionic converter with chloride vapor deposited tungsten emitter and nickel collector
[NASA-CR-1416]
p0222 N69-32553

Selected thermoelectric, thermionic, and electron-voltaic energy conversion device characteristics
[SC-ARPIC-1011]
p0224 N69-38033

Thermionic converter development status from viewpoint of prospective engineering use
p0229 N70-16226

Basic converter physics and thermionic reactor design indicating role of electron energy loss reduction in converter
[AD-699944]
p0232 N70-26434

Possible space application of incore thermionic reactor particularly for direct television broadcasting
[BMBA-FB-W-70-16]
p0233 N70-30407

Modular design of out-of-core nuclear thermionic power conversion system
[NASA-TM-X-68049]
p0247 N72-23675

Miniodiode-diode for improving performance of nuclear thermionic systems
[NASA-TM-X-2586]
p0248 N72-28685

THERMOCHEMICAL PROPERTIES

Thermochemical MHD converter performance determined by slug model governed by differential equations
p0130 A68-29901

THERMOCHEMISTRY

Experimental studies in nuclear chemistry and thermochemistry for improved reactor fuels
[ANL-7575]
p0090 N70-19586

THERMOCOUPLES

Design and performance equations for panel type solar thermoelectric generator, based on single thermocouple as generator unit
p0026 A69-15675

Radioisotope thermoelectric generators /RTG/ design and performance analysis method applied to generators using Si-Ge Air-Vac type thermocouples
p0161 A69-42260

Thermoelectric panel array of hybrid thermocouples with p-type Si-Ge encapsulated PbTe/Si-Ge n-legs, presenting performance test results as function of test time
p0184 A73-22766

Thermoelectric nuclear batteries fabrication in milliwatt power range combining bismuth telluride thermopiles with plutonia fuel capsules
p0188 A73-38410

The multi-hundred watt RTG - Technology background and flight systems program.
p0189 A73-38418

Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection
p0189 A73-38422

SUBJECT INDEX

THERMODYNAMIC PROPERTIES

- Curium 244 heat source design for multihundred
Watt radioisotope thermoelectric generator with
Si-Ge thermocouples for energy conversion,
noting low cost p0077 A73-38429
- Techniques for large scale solar energy conversion
into electrical power p0054 N69-30038
[JPRS-48222]
- THERMODYNAMIC CYCLES**
- Thermodynamic cycle and optimum conditions of
electric power source of MHD generator in
combination with thermocompressor p0142 A69-21592
- Thermal efficiencies of liquid-metal MHD generator
cycles, analyzing optimum parameters, working
fluid and partial irreversibilities p0148 A69-27484
- Optimal cycle parameters for liquid metal single
component MHD cycle, employing condensing
elector in front of generator p0148 A69-27488
- Liquid metal MHD generator cycles thermodynamic
analysis, considering multicycle operation
improvement with heat regeneration p0148 A69-27489
- Piston-like laminar liquid metal flow in MHD
generator to increase thermodynamic efficiency
of cycle and to generate electricity by
synchronous principle p0148 A69-27491
- Ideal MHD induction converter pressure and
generator cycles compared for calculating
maximum output and pressure, considering
current-conducting walls effects p0151 A69-28887
- Thermodynamic parameters of MHD cycle employing
supercritical Hg, indicating need for more
suitable fluids p0156 A69-31914
- Reversible thermodynamic cycle of chemical to
electric energy conversion with electron gas as
working body, discussing Gibbs-Helmholtz equations
p0180 A72-32994
- Large-scale concentration and conversion of solar
energy p0039 A72-36075
- Thermomagnetic and thermoelectric effects used to
improve energy conversion efficiency of
thermodynamic cycles p0201 N68-22013
[DGLR-68-0051]
- Thermodynamic properties of liquid metal cycle in
magnetohydrodynamic power generator with heat
regeneration p0208 N69-11944
- Thermodynamic characteristics of high temperature
open cycles p0212 N69-13345
[SM-74/2351]
- Thermodynamic analysis of supercritical mercury
heat engine and magnetohydrodynamic generator
[AE-355] p0224 N69-35785
- Nuclear reactors for electric power sources in
space applications p0226 N70-11305
- Three thermodynamic cycles of advanced nuclear MHD
power plant systems p0253 N73-28657
- THERMODYNAMIC EFFICIENCY**
- MHD generator and compressor Joule losses effect
on thermoelectric energy conversion closed cycle
efficiency with electrical conductivity
maintained by nonequilibrium ionization p0131 A68-31226
- Throttling effect on thermodynamic efficiency of
MHD generator Rankine cycle with various working
fluids p0134 A68-41271
- Closed-loop cycle converter, composed of MHD
generator and compressor consuming thermal
energy, exhibiting moderate cycle efficiency
decreases p0134 A68-41272
- MHD generator and compressor Joule losses effect
on thermoelectric energy conversion closed cycle
efficiency with electrical conductivity
maintained by nonequilibrium ionization p0140 A69-14152
- Thermoelectric power generators energy output
efficiency, discussing thermal and electric
contact resistances influence for optimizing
parameters p0147 A69-26364
- Thermal efficiencies of liquid-metal MHD generator
cycles, analyzing optimum parameters, working
fluid and partial irreversibilities p0148 A69-27484
- Piston-like laminar liquid metal flow in MHD
generator to increase thermodynamic efficiency
of cycle and to generate electricity by
synchronous principle p0148 A69-27491
- MHD generators physical phenomena, discussing
thermal efficiency, inlet parameters, operating
principles, etc p0163 A70-14716
- Computerized calculation of gas turbine cycles
thermal efficiency, using hydrocarbon fuel,
considering fuel composition and heat of
combustion changes p0073 A70-43439
- Thermosiphon evaporation-condensation-evaporation
cycle cooling system operation and effectiveness
in thermoelectric cooling and generator devices
p0187 A73-30950
- A solar engine using the thermal expansion of
metals. p0046 A73-38473
- Direct conversion of thermonuclear plasma energy
by high magnetic compression and expansion.
p0190 A73-41676
- Parametric analysis of effects of concentrator
surface errors and rim angle, collection system
orientation error, and receiver temperature on
paraboloid solar collector thermal efficiency
[NASA-TN-D-4415] p0047 N68-18998
- Effect of output on thermal efficiency in electric
power stations using MHD generators p0211 N69-13329
[SM-74/204]
- Thermodynamics of two component liquid metal MHD
power plant with vapor-liquid injector p0212 N69-13335
[SM-74/218]
- Mathematical model for thermodynamic efficiency of
combined power plants incorporating
magnetohydrodynamic generators p0252 N73-18090
[AD-753031]
- THERMODYNAMIC EQUILIBRIUM**
- Thermal steady state characterization of isotopic
radioisotope thermoelectric generator,
discussing design features and heat transfer
models for operating temperatures and output
performance p0163 A70-14897
[ASME PAPER 69-WA/ENER-12]
- Thermodynamic analysis of supercritical mercury
heat engine and magnetohydrodynamic generator
[AE-355] p0224 N69-35785
- THERMODYNAMIC PROPERTIES**
- Open cycle MHD generators optimization, predicting
thermodynamic properties, electrical loading, etc
p0133 A68-39724
- Incandescent thermionic cell power output limitation and
thermal/electrical data determination at steady
state operation, considering temperature
distribution p0172 A71-25894
- Combustion products thermodynamic parameters for
natural gas burning in oxygen atmosphere,
plotting gas temperature and flow rates against
pressure and excess oxidant ratio p0075 A72-29451
- Mathematical simulation of solution-gas drive
performance of volatile oil reservoir using
digital computer p0080 N68-21048
- Fabrication and test performance of solar
thermionic collector-radiator heat pipe structure
[NASA-CR-94402] p0048 N68-22991
- Thermodynamic properties of liquid metal cycle in
magnetohydrodynamic power generator with heat
regeneration p0208 N69-11944
- Composition and thermodynamic properties of
combustion products of methane and air-oxygen
[SM-74/217] p0082 N69-13334
- Six converter solar thermionic generator
[NASA-CR-98712] p0052 N69-14920

- NASA development work on high efficiency batteries for space electric power systems
[NASA-SF-172] p0265 N69-18042
- Electrical, thermal, and optical properties of semiconductors associated with energy conversion
[AD-693235] p0056 N70-11427
- Thermal response of bimetal thermostat solar array orientation device
p0063 N72-13396
- Development of method for analyzing performance of magnetohydrodynamic generator based on thermodynamic properties and flow characteristics
p0252 N73-19051
- THERMODYNAMICS**
- Thermodynamics and design of open and closed cycle MHD energy conversion generators emphasizing end effects, Hall effects, heat transfer and aerodynamic losses
[AGARDOGRAPH 81] p0123 A68-22530
- Thermodynamic theory of irreversible processes in thermoelectric conversion, discussing Thomson and Peltier effects and ideal generator
[AGARDOGRAPH 81] p0125 A68-22539
- Book on fuel cells and fuel batteries covering thermodynamics, electrocatalysis, overvoltage, Gemini spacecraft battery, etc
p0139 A68-44312
- Monograph on fuel cells covering thermodynamics, electrode polarization principles, electrocatalysis, system requirements, operational principles and applications
p0178 A72-24700
- Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation
p0039 A72-35509
- Irreversible thermodynamics and losses in energy conversion, discussing N-port storage representation, flux rate, power flow and electro-caloric and state space relations
p0183 A73-20396
- Thermodynamic properties of thermionic emitters, electron collectors, and ionization and excitation of gas in interelectrode spaces of thermionic energy converters
p0196 N68-17805
- State-of-the-art review on thermodynamics and applications of bioelectrochemical energy conversion processes
p0199 N68-17826
- Thermodynamic properties of heat regeneration injector in magnetohydrodynamic generators - structural design, efficiency prediction, water steam flow, and multiphase flow discontinuities
[JPRS-46752] p0208 N69-11943
- Conference on magnetohydrodynamic generators, plasmas, energy conversion for electric power plants, and electrodynamics
[AD-674611] p0012 N69-13314
- Thermodynamic characteristics of high temperature open cycles
[SM-74/235] p0212 N69-13345
- Thermoelectric materials and semiconductor thermoelements
[AD-690786] p0227 N70-13348
- Thermodynamic characteristics of electrochemical energy conversion into electrical energy
[AD-713675] p0240 N71-16314
- Thermodynamics of honeycomb porous bed solar generators with and without fluid transpiration including generator designs
p0062 N71-28586
- Design of high temperature combustor for use as solid fuel MHD generator and thermodynamic analysis of combustion conditions
[AD-764153] p0254 N73-31848
- THERMOELECTRIC COOLING**
- Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion
p0138 A68-42954
- Test apparatus and technique for assessing Peltier thermoelectric cooling device operational characteristics
p0178 A72-27721
- Thermoelectric cooling devices materials figure of merit upper limits above room temperature, using semiconductor parameters experimental values
p0179 A72-27722
- Thermosiphon evaporation-condensation-evaporation cycle cooling system operation and effectiveness in thermoelectric cooling and generator devices
p0187 A73-30950
- THERMOELECTRIC GENERATORS**
- Thermoelectric converters for direct thermal to electric energy conversion, citing SNAP isotopic generator space power systems
p0119 A68-11240
- Thermoelectric conversion of energy and radioisotope generators studied for selection criteria for power sources
p0119 A68-14136
- Problems and various processes of direct energy conversion covering thermoelectric, MHD generators, radionuclide batteries, thermionic converters and galvanic cells
p0121 A68-17792
- Thermoelectric generator design using ultrasonic atomizing burner and SiGe converter
p0121 A68-17827
- Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0023 A68-18449
- MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0131 A68-31226
- Thermoelectric converters efficiency as function of Si photocells optical characteristics
p0025 A68-39356
- Materials limitations and problems for direct energy conversion methods of thermoelectricity, solar cells, thermionics and fuel cells
p0133 A68-41217
- SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
p0137 A68-42528
- MHD generator and compressor Joule losses effect on thermoelectric energy conversion closed cycle efficiency with electrical conductivity maintained by nonequilibrium ionization
p0140 A69-14152
- Design and performance equations for panel type solar thermoelectric generator, based on single thermocouple as generator unit
p0026 A69-15675
- Heat conversion coefficients and initial temperature of active elements of solar powered electric devices
p0151 A69-28314
- Thermal contacts effects on optimum operating conditions of solar thermoelectric power generator, discussing losses due to low thermal conductivity coefficient of insulating layers
p0027 A69-32797
- Laboratory device for investigating thermionic energy converters and measuring current-voltage characteristics by static/dynamic methods
p0156 A69-34700
- Gisette 5 thermoelectric radioisotopic generator for submarine use, discussing strontium 90 as isotopic source
p0072 A69-38458
- Radioisotope thermoelectric generators /RTG/ design and performance analysis method applied to generators using Si-Ge Air-Vac type thermocouples
p0161 A69-42260
- Semiconductor solar thermoelectric generator allowing thermoelement replacement during service including construction, bridging methods and characteristics
p0030 A70-10751
- Current-voltage characteristics of cascaded solar thermoelectric generator, determining optimum hot junction temperature as function of radiation concentration
p0030 A70-10752
- Selective glass coatings applications in solar thermoelectric generators working without radiation concentrators
p0031 A70-10767

SUBJECT INDEX

THERMOELECTRIC GENERATORS CONTD

- Thermoelectric-couple life tests and efficiency measurements at constant thermal input, noting insulation for limiting parasitic heat losses [ASME PAPER 69-WA/ENER-14] p0163 A70-14896
- Thermal steady state characterization of isotope radioisotope thermoelectric generator, discussing design features and heat transfer models for operating temperatures and output performance [ASME PAPER 69-WA/ENER-12] p0163 A70-14897
- Commercial thermoelectric generator design, applications and economics compared to batteries and small MG sets p0165 A70-25033
- Electroquasidynamic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures p0165 A70-27330
- Solar thermoelectric generator /STEG/ with two stage converter, discussing weight factors and efficiency p0032 A70-32425
- Thermoelectric generators design for space and remote terrestrial sites, discussing fuel source, conversion section, heat rejection, etc p0167 A70-39225
- Electroquasidynamic generator with spatial charge neutralization for direct thermal-to-electrical energy conversion at high gas pressures p0170 A70-42071
- Book on direct energy conversion principles and methods covering fusion, fuel cells, MHD, thermoelectric, thermionic, photovoltaic, electrohydrodynamic, piezoelectric and ferroelectric power generation p0171 A71-11193
- Cost optimization for solar generator thermobatteries by selecting temperature, contact resistance, material parameters and fabrication technology p0036 A71-31671
- Reliability analysis of solar thermoelectric generator module as function of individual photocells, circuit design and redundancy p0036 A71-31672
- Long life performance predictions for lead telluride and silicon germanium radioisotope thermoelectric generators for deep space missions p0175 A71-38925
- Multihundred watt radioisotope thermoelectric generator for spacecraft power supply, discussing system design, performance and safety requirements p0176 A71-38927
- Unitized bellow radioisotope thermoelectric generator concept for long term stability, using standardized design, fabrication and qualification [ASME PAPER 71-WA/ENER-1] p0177 A72-15940
- Thermoelectric generators theory, design and performance characteristics, discussing Seebeck, Peltier and Thomson effects p0180 A72-31375
- Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation p0039 A72-35509
- United States Space Nuclear Electric Power Program. p0181 A72-45179
- Design point characteristics of a 500 - 2500 watt isotope-Brayton power system. [AIAA PAPER 72-1059] p0182 A73-13388
- Thermoelectric radioisotope generators and nuclear thermoelectronic reactors, noting anaerobic self contained reliable operation and suitability for underwater energy sources p0183 A73-22203
- Thermoelectric panel array of hybrid thermocouples with p-type Si-Ge encapsulated PbTe/Si-Ge n-legs, presenting performance test results as function of test time p0184 A73-22766
- Isotope Brayton electric power system for the 500 to 2500 watt range. p0184 A73-22793
- TRANSIT radioisotope thermoelectric generator technology, discussing structural design, thermal efficiency, performance prediction, panel configurations and life test data p0186 A73-26034
- Thermosiphon evaporation-condensation-evaporation cycle cooling system operation and effectiveness in thermoelectric cooling and generator devices p0187 A73-30950
- Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources. p0188 A73-38389
- Feasibility analysis of satellite solar/thermal power generation and transmission to earth, describing Brayton cycle heat engine for initial energy conversion p0046 A73-38404
- Thermoelectric nuclear batteries fabrication in milliwatt power range combining bismuth telluride thermopiles with plutonia fuel capsules p0188 A73-38410
- Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range. p0189 A73-38414
- The multi-hundred watt RTG - Technology background and flight systems program. p0189 A73-38418
- Multihundred watt radioisotope thermoelectric generator design for on-pad and orbital conditions, discussing configurations, Pu-238 heat source and operating characteristics p0189 A73-38419
- Multihundred watt power supply with Si-Ge thermoelectric couples for Pu-238 source heat energy conversion into electric power, discussing computer model for performance projection p0189 A73-38422
- Curium 244 heat source design for multihundred watt radioisotope thermoelectric generator with Si-Ge thermocouples for energy conversion, noting low cost p0077 A73-38429
- Fuel capsule vent system development for the Viking radioisotope thermoelectric generator. p0077 A73-40766
- High-efficiency converter and battery charger for an RTG power source. p0190 A73-42906
- Deep sea radioisotope fueled thermoelectric generator power supply system design [MMN-3691-20] p0191 N68-11382
- Thermoelectric and mechanical performance of silicon-germanium solar thermoelectric generator [NASA-CR-72340] p0046 N68-12252
- Parametric analysis of radioisotope cascaded thermoelectric generators with Si-Ge first stage and PbTe second stage [NASA-TN-X-1501] p0192 N68-14585
- Effective volume power density analysis for radioisotope power generator with silicon germanium thermoelectric elements [NASA-TN-X-1453] p0193 N68-14630
- Design and performance study of flat plate thermoelectric generators for solar probes [NASA-TN-X-52451] p0050 N68-31018
- Effect of boost environment on design of large area solar array, its release and deployment on ground and in space, and electrical power source analysis [NASA-CR-95999] p0051 N68-31404
- SNAP 19 thermoelectric generator technology development [MND-3607-239-3, V. 3] p0207 N68-37951
- Aerial detection of Co 60 fueled radioisotope thermoelectric generators [SC-TN-68-627] p0013 N69-19492
- Feasibility of construction and use of solar thermoelectric generators in India [M7] p0054 N69-24313
- Selected thermoelectric, thermionic, and electron-voltaic energy conversion device characteristics [SC-ARFIC-1011] p0224 N69-38033
- Helium release from plutonium-238 dioxide fuels for radioisotope thermoelectric generator heat sources [SC-RK-69-662] p0091 N70-21251
- Design and performance of cascaded thermoelectric generator [NASA-CR-110877] p0238 N70-42733
- Manufacturing processes for production of solar cells p0060 N71-17248

THERMOELECTRIC MATERIALS

SUBJECT INDEX

Computer controlled electrical measuring devices for thermoelectric generator of power plant
[AD-727461] p0244 N71-38010

Low weight, integrated thermoelectric generator/antenna combination for spacecraft
[NASA-CASE-XPR-09521] p0246 N72-12136

Thermoelectric and ventilating system designs for use in protective military clothing
[AD-737720] p0247 N72-24139

Thermally cascaded thermoelectric generator with radioisotopic heat source
[NASA-CASE-NPO-10753] p0247 N72-26031

Efficiency and thermal losses of radioisotope thermoelectric generator
[FRNC-CONF-13] p0248 N72-28731

Physics of thermoelectric process, properties of semiconducting materials, and characteristic of thermoelectric generators
[AD-741958] p0248 N72-29045

Optimization of specific power highly efficient radioisotope thermoelectric generator
p0251 N73-16636

Principles of magnetohydrodynamic energy generation to include flows in magnetohydrodynamic generator, physical processes, diagnostics, and required equipment - Part 1
[JPAS-5794(-1-PT-1)] p0251 N73-16687

Principles of magnetohydrodynamic energy generation to include open and closed cycle magnetohydrodynamic generators, liquid-metal plants, and materials for generators -Part 2
[JPAS-5794(-2-PT-2)] p0251 N73-16688

Reliability analysis of thermoelectric module solar energy converter
[AD-757087] p0067 N73-23015

THERMOELECTRIC MATERIALS

High temperature thermoelectric materials limitations in energy conversion systems
[AGARDOGRAPH 81] p0125 A68-22540

Direct energy conversion and materials limitations, discussing thermoelectricity, solar cells, thermionics and fuel cells
p0140 A69-11801

Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect
p0162 A70-10754

Thermoelectric-couple life tests and efficiency measurements at constant thermal input, noting insulation for limiting parasitic heat losses
[ASME PAPER 69-WA/ENER-14] p0163 A70-14896

Thermoelectric cooling devices materials figure of merit upper limits above room temperature, using semiconductor parameters experimental values
p0179 A72-27722

Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range.
p0189 A73-38414

Multihundred watt radioisotope thermoelectric generator heat source materials compatibility with thermochemical environment, considering maximum operational and reentry temperatures
p0076 A73-38427

Physics of thermoelectric process, properties of semiconducting materials, and characteristic of thermoelectric generators
[AD-741858] p0248 N72-29045

THERMOELECTRIC POWER GENERATION

Infinitely sequenced electrode thermoelectric direct energy conversion device performance and characteristics
p0119 A68-11941

Thermodynamic theory of irreversible processes in thermoelectric conversion, discussing Thomson and Peltier effects and ideal generator
[AGARDOGRAPH 81] p0125 A68-22539

High temperature thermoelectric materials limitations in energy conversion systems
[AGARDOGRAPH 81] p0125 A68-22540

SNAP 29 heat source using Po 210, considering configuration, fuel block and fuel capsule designs
p0137 A68-42528

Thermoelectric power generators energy output efficiency, discussing thermal and electric contact resistances influence for optimizing parameters
p0147 A69-26364

Electricity from MHD - Conference, Warsaw, July 1968, Volume 4, Open cycle MHD
p0006 A69-28021

Thermoelectric power generator with variable thermal conductivity and electrical resistivity, obtaining steady state temperature distribution, power output and thermal efficiency
p0157 A69-40131

STAR /Stud and Rocker Panel/ four couple section improved by incorporating bonded tungsten electrical contacts for PbTe thermoelectric elements
p0162 A69-42261

Cascaded thermoelements with high figure of merit for increasing solar thermoelectric generator efficiency, noting high temperature materials effect
p0162 A70-10754

Aerospace radioisotope power systems, discussing heat source technology, shielding, safety and thermoelectric integration
[SAE AIR 1213] p0176 A72-10387

Unmanned reactor-thermoelectric systems for applications in the 1970's.
p0186 A73-26024

Portable 560-watt thermoelectric power module
[AD-662770] p0193 N68-15230

High temperature material limitations in thermoelectric energy conversion
p0198 N68-17820

Thermomagnetic and thermoelectric effects used to improve energy conversion efficiency of thermodynamic cycles
[DGLR-68-005] p0201 N68-22013

Thermoelectric converter for nuclear energy system
[BMWP-FB-W-68-10] p0202 N68-24189

Compilation of references on direct conversion of heat into electrical energy
[BLG-427] p0223 N69-32934

Present stand and potential use of MHD generators for electric power production
[POA-4-C-4325-55] p0223 N69-35224

Thermodynamic analysis of supercritical mercury heat engine and magnetohydrodynamic generator
[AE-355] p0224 N69-35785

Space power systems lectures on sources and requirements
[ESRO-SP-45] p0226 N70-11301

Isotopic energy sources for space applications
p0226 N70-11304

Fuel cells and storage batteries for different types of energy conversion
[AD-696428] p0230 N70-21253

Thermoelectric power conversion by liquid metal flowing through magnetic field
[NASA-CASE-XPR-00644] p0236 N70-36803

Describing general characteristics of system for direct conversion of thermal into electrical energy by thermodynamic analysis
p0239 N71-13249

Analysis of magnetoplasma dynamic converters
[AEC-TR-7161] p0239 N71-15010

Physics of thermoelectric process, properties of semiconducting materials, and characteristic of thermoelectric generators
[AD-741858] p0248 N72-29045

THERMOELECTRICITY

Thermoelectric generators theory, design and performance characteristics, discussing Seebeck, Peltier and Thomson effects
p0180 A72-31375

Electrothermal and thermal modes of regeneration in fuel cells for space power applications
p0199 N68-17825

Materials, plasma, and electrochemical research on unconventional energy conversion techniques
[NASA-CR-93979] p0010 N68-21035

Thermoelectric, thermionic, and Brayton conversion devices for radioisotopic power generators
[AD-687131] p0223 N69-32804

Magnetohydrodynamic flow, surface properties, silicon solar cells, and thermoelectric properties of graphite compounds
p0223 N69-34812

Thermoelectric materials and semiconductor thermoelements
[AD-690786] p0227 N70-13348

SUBJECT INDEX

THORIUM OXIDES

THERMOMAGNETIC COOLING

- Infinitely sequenced electrode thermoelectric direct energy conversion device performance and characteristics p0119 A68-11941
- Staging of heat engines or coolers, calculating efficiency and performance coefficient for devices using thermoelectric and thermomagnetic energy conversion p0138 A68-42954

THERMONUCLEAR POWER GENERATION

- High temperature plasmas and attempts to achieve controlled thermonuclear fusion, discussing plasma properties p0132 A68-38740
- Fusion energy technology, discussing controlled reactor construction and operation p0171 A71-20000
- Pulsed power - A new technology for controlled thermonuclear fusion. p0181 A72-36332
- Review of controlled fusion research using laser heating. [AIAA PAPER 73-258] p0183 A73-17667
- Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion. p0190 A73-41676
- Economic generation of power from thermonuclear fusion [CLM-R-85] p0202 N68-25016
- Plasma production and heating by laser radiation with plasma control and production of thermonuclear plasma discussed [NP-17453] p0204 N68-30330
- Niobium diffusion process for removing tritium from blanket of thermonuclear reactor [ORNL-TM-2358] p0083 N69-19229
- Comparison of Brayton and Rankine cycle magnetohydrodynamic space power generation systems for use with nuclear heat source [NASA-TN-D-5085] p0217 N69-20852
- All metal thermionic nuclear module [CEA-CONF-1041] p0218 N69-24985
- Electron screening effects on thermonuclear reactions under high densities [ITF-69-7] p0223 N69-34199
- Thermonuclear power reactor design using lithium blanket for plasma control and regeneration of tritium fuel consumed in basic reaction [UCRL-71500] p0226 N70-12638
- Pulsed thermonuclear reactor operated with lasers [ABC-TR-7148] p0237 N70-38825
- Investigating relationship of conversion efficiency to fixed and variable costs in fusion reactors [UCRL-72349] p0239 N71-15242
- Solar energy, thermonuclear energy, and fission fuel energy sources [UCRL-74697] p0022 N73-33005

THERMONUCLEAR REACTIONS

- Research studies in plasma physics, thermonuclear reactions, and magnetohydrodynamic generators [AFOSR-68-1377] p0206 N68-31928
- Technological level and production of atomic industry in U.S.S.R. and other nations [NIC-TRANS-2653] p0011 N68-38243
- Thermonuclear reactions for electric power production [AD-691465] p0225 N69-40792

THERMOPHYSICAL PROPERTIES

- Mathematical analysis of high temperature solar furnace characteristics [AD-704754] p0059 N70-32426
- Measurements of thermophysical properties of compressed fluid methane and survey of current literature on liquefied natural gas and methane [NBS-9781] p0095 N71-22717

THERMOSIPHONS

- Thermosiphon evaporation-condensation-evaporation cycle cooling system operation and effectiveness in thermoelectric cooling and generator devices p0187 A73-30950

THETA PINCH

- Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion. p0190 A73-41676

THICK FILMS

- Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystem p0173 A71-30801

THIN FILMS

- Thin film solar cell materials, fabrication, structure and properties related to energy conversion efficiency in space applications p0024 A68-20738
- CdS thin film solar cell noting advantages over silicon photovoltaic cells for converting light into electric energy p0024 A68-34613
- Cadmium sulfides thin film solar cells for supplying power to instrumentation and data telemetry on longer lived balloons p0027 A69-31287
- CdS thin film solar cells, describing manufacture for increased degradation resistance p0033 A70-43537
- French R and D programs on Si and various thin film photovoltaic solar cells, considering efficiency, reliability, and weight and cost reduction problems p0037 A72-28002
- Thin film Cu-CdS solar cell electrochemical plating potential and solution composition effects on copper sulfide surface layer formation and cell efficiency p0038 A72-28008
- Improved efficiency of cadmium sulfide-copper sulfide thin film solar cells, noting optimization of layer formation, gridding and encapsulation p0038 A72-28016
- Radiovoltaic generator energy conversion by thin film solar cells, noting performance dependence on semiconductor band gap and radioisotope characteristics p0038 A72-28021
- New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell. p0041 A73-14220
- Historical development of solar cells. p0044 A73-29590
- CdTe thin film fabrication by direct synthesis of vacuum evaporated Cd and Te, noting solar cell efficiency increase after storage in room temperature exsiccator p0045 A73-30475
- Solar energy conversion into thermal, chemical or electric energy, discussing high efficiency collector design with thin film for absorber and glass envelope improvement [AIAA PAPER 73-710] p0045 A73-36331
- Development and testing of cadmium sulfide thin film solar array subpanels [NASA-CR-72439] p0051 N68-33207
- Plastic substrate, cadmium sulfide thin film solar cell [NASA-CR-72534] p0054 N69-23369
- Reports on electric automobiles, plasma spraying, sintering, and vapor deposition thickness measurements p0265 N69-34688
- Thin-film solar cells for large-area arrays p0058 N70-30231
- Photoelectric solar converter using cadmium sulfide and cadmium selenide tablets or thin films [AD-756594] p0067 N73-21960

THORIUM

- Research on sol-gel stimulated by results on thorium and interest in fast reactor fuels [RT/CHI/68/28] p0082 N69-11048
- Cost of thorium fuel cycles for heavy water and graphite moderated reactors [EUR-4264.E] p0085 N69-31081

THORIUM ISOTOPIES

- Th 228 decay from short and long term simulation tests of thorium dioxide heat source in thermionic energy converter with W capsule p0075 A72-36162

THORIUM OXIDES

- Th 228 decay from short and long term simulation tests of thorium dioxide heat source in thermionic energy converter with W capsule p0075 A72-36162

THROTTLING

SUBJECT INDEX

THROTTLING

Throttling effect on thermodynamic efficiency of MHD generator Rankine cycle with various working fluids

p0134 A68-41271

THRUST

Hall type electromagnetic plasma accelerator, with thrust affected only by Lorentz forces in external magnetic field, compared to pure Hall accelerator

p0146 A69-25214

TIMBER INVENTORY

FRTS-1 inquiry of landscape changes, strip mines, timber, agriculture, and water resources in eastern Tennessee

[F73-10843] p0110 N73-28421

TIMBER VIGOR

Aerial photographic analysis of effects caused by coal combustion induced pollutants on Eastern white pine and vegetation

p0101 N72-29363

TIME MEASUREMENT

Buildup time for nonequilibrium argon ionization at inlet of MHD generator channel

p0122 A68-19914

TITANATES

Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector

[ASMP PAPER 73-ENAS-7] p0045 A73-37969

TITANIUM ALLOYS

Titanium alloy honeycomb with blackened walls as absorber of solar energy

[NASA-TN-D-4727] p0050 N68-30751

Superconducting magnet of niobium-titanium and copper composite for use in controlled thermonuclear fusion research

[UCLR-71010] p0218 N69-22640

Research and development of superconducting magnetic systems for MHD generators using Nb-Ti alloys

[AD-706779] p0237 N70-37715

TOPS (SPACECRAFT)

Thick film microcircuit DC-TO-DC converter electronics design for TOPS spacecraft power subsystem

p0173 A71-30801

TOROIDAL PLASMAS

Explaining Tokamak stability by elimination of MHD instabilities when cylindrical Bennett pinch bent into torus

[OPNL-TM-2766] p0230 N70-19953

Estimation of power requirement of plasma heating in self-sustaining toroidal fusion devices

[MATT-873] p0246 N72-11641

TRACE ELEMENTS

Trace element characterization in oil polluted water by neutron activation analysis

p0088 N70-15236

Contaminant determination in oil by neutron activation analysis

p0089 N70-15280

Using neutron activation analysis for quantitative measurement of trace elements in crude and residual fuel oils

[GA-9889] p0094 N71-15083

TRACKING (POSITION)

Passive sun trackers using solar energy activated bimetal helix thermal heliotrope

p0033 A70-34131

Passive solar array orientation devices for terrestrial application.

p0043 A73-22440

TRAJECTORIES

Mission analysis for solar electric propelled spacecraft on Mars Orbiter, Jupiter flyby, and asteroid belt exploration trajectories

[NASA-CF-106089] p0055 N69-38783

TRANSFER FUNCTIONS

Transfer functions for primary loop of conceptual nuclear Brayton space power plant

[NASA-TN-X-2193] p0240 N71-17933

TRANSFORMERS

Kilowatt rotatory dc-dc power transformer in modular sections for spacecraft applications, discussing electrical and mechanical designs and characteristics

p0178 A72-21414

Fusion reactor employing large transformer core and inductive energy system to replace stabilized stellarator windings

[MATT-659] p0218 N69-23954

TRANSIENT HEATING

Transient solidification outside cooled pipe with application to solar Brayton heat receiver

[NASA-TN-D-4897] p0052 N69-10227

TRANSIENT RESPONSE

Transient response in liquid-metal conduction MHD generators, analyzing constant magnetic field using differential equation

p0150 A69-27506

Molten carbonate fuel cell and molten electrolyte battery for electrically and thermally efficient power source with fast transient response

[AD-692538] p0226 N70-10447

TRANSIT SATELLITES

TRANSIT radioisotope thermoelectric generator technology, discussing structural design, thermal efficiency, performance prediction, panel configurations and life test data

p0186 A73-26034

TRANSIT 1B SATELLITE

Description of solar conversion/energy storage power systems used on Transit 1B, 3B and 4B satellites

p0056 N70-12695

TRANSIT 3B SATELLITE

Description of solar conversion/energy storage power systems used on Transit 1B, 3B and 4B satellites

p0056 N70-12695

TRANSIT 4A SATELLITE

Description of solar conversion/energy storage power systems used on Transit 1B, 3B and 4B satellites

p0056 N70-12695

TRANSMITTER RECEIVERS

Low weight, integrated thermoelectric generator/antenna combination for spacecraft

[NASA-CASE-XER-09521] p0246 N72-12136

TRANSPIRATION

Thermodynamics of honeycomb porous bed solar generators with and without fluid transpiration including generator designs

p0062 N71-28586

TRANSPORT AIRCRAFT

Hypersonic aircraft technology, discussing long range transport, reusable launch vehicles and propulsion systems

p0115 A70-31851

Civil transport aircraft future design trends, discussing subsonic, supersonic, hypersonic and V/STOL aircraft, engine design, fuels and noise reduction

p0076 A73-23682

Large payload aircraft for Alaskan and Canadian gas-oil transportation, examining alternative pipeline economic factors and possible new North Canadian island fuel fields

p0257 A73-33183

Hypersonic transports - Economics and environmental effects.

p0009 A73-34435

TRANSPORT PROPERTIES

Direct solar radiation concentration by paraboloid mirrors, analyzing energy transport and distribution functions, based on statistically distributed imperfections of reflecting surfaces

p0030 A70-10762

Atmospheric transport and diffusion of radioactive pollutants - relationship between meteorology and atomic energy industry

[TID-24190] p0012 N69-17184

Thermodynamic analysis of supercritical mercury heat engine and magnetohydrodynamic generator

[AE-355] p0224 N69-35785

TRANSPORTATION

Algorithm for optimization of transportation and storage in petroleum industry

p0257 N68-14618

Review and screening of defense and space oriented technology applicable to urban transportation problems

[PB-178272] p0011 N68-31690

Safety criteria for nuclear fuel transport

p0257 N69-37570

SUBJECT INDEX

TURBOJET ENGINES

Energy used in intercity freight transportation by water, rail, pipeline, truck, and air, and effect of fuel price increases
[R-804-NSF] p0258 N72-23979

Effects of transportation combustion products in air pollution
[PB-213034] p0020 N73-20991

Fuel consumption profiles of passenger and freight transportation modes
[P-4935] p0021 N73-23962

TRANSURANIUM ELEMENTS
Radioisotopes as energy source for power conversion systems, discussing future availability of fission products and transuranium elements from commercial nuclear power reactors
p0074 A71-38948

TRANSVERSE WAVES
Transverse edge effect in plane induction magnetohydrodynamic generators
p0194 N68-16290

TRAVELING WAVES
Traveling wave MHD induction generator with variable fluid velocity having rotating machine internal electrical efficiency
[JPL-TM-32-1328] p0133 A68-39723

Friction losses and efficiency of finite length magnetohydrodynamic traveling wave cylindrical accelerator or generator
p0204 N68-30018

TRENDS
Magnetohydrodynamic generator design trends
[PTD-HT-66-378] p0192 N68-13094

TRIODES
Vacuum thermionic converter with short-circuited triodes and increased electron transmission and conversion efficiency
[NASA-CASE-XLE-01015] p0225 N69-39898

TRITIUM
Niobium diffusion process for removing tritium from blanket of thermonuclear reactor
[ORNL-TM-2358] p0083 N69-19229

Hazard evaluation for deuterium tritium fusion reactor power plant
[ORNL-TM-2822] p0015 N70-37097

TROPOSPHERE
Radiation danger of Kr-85 in troposphere and lower stratosphere from worldwide nuclear power plants
[JPRS-53174] p0016 N71-26623

TRUCKS
Development status and feasibility of battery powered vehicles
[PB-174982] p0193 N68-15499

Fuel cell-battery hybrid power source for electric cars
[AD-662235] p0193 N68-15525

Fuel cell-battery hybrid power source for automobiles
[AD-662236] p0193 N68-15641

TUNGSTEN
Thermionic emission characteristics of W and Mo subjected to focused CW carbon dioxide laser radiation, discussing direct energy conversion
p0162 A70-12068

Output performance of a thermionic converter with an oriented tungsten /110/ emitter and a polycrystalline tungsten collector.
p0180 A72-34604

Th 228 decay from short and long term simulation tests of thorium dioxide heat source in thermionic energy converter with W capsule
p0075 A72-36162

TUNGSTEN CHLORIDES
Thermionic converter with chloride vapor deposited tungsten emitter and nickel collector
[NASA-CR-1416] p0222 N69-32553

TUNING
Two stage gas turbine engine optimal tuning for RPM, thrust, fuel rate and gas temperature, describing automated bench tests
p0170 A70-43361

TURBINE BLADES
Aerodynamic problems in cooled turbine blading design for small gas turbine engines
p0220 N69-26532

TURBINE ENGINES
Materials and cooling of aircraft gas turbine engines noting nickel and tantalum alloys, turbine inlet temperatures, coatings, etc.
p0122 A68-19791

Application and characteristics of cryogenic fuels for air breathing gas turbine engines
p0118 N71-19463

Reduction of harmful emissions of turbine engine exhaust system
p0097 N72-11675

Comparison of Wankel engine characteristics with small reciprocating and jet engines used as power plants in light aircraft
[REPT-908] p0247 N72-20764

Analytical measurements of exhaust emissions from aircraft turbine engines using Jet A fuel
[BM-RI-7634] p0100 N72-25584

TURBINES
Steel construction design parameters for building and operating ZYKLON type wind driven power plants
[NASA-TT-P-14872] p0106 N73-21253

Design of MHD generators with fuel gas and air turbine
[JUL-892-TP-VOL-11] p0254 N73-30699

TURBOCOMPRESSORS
Rankine cycle low power turbocompressor for space applications
p0196 N68-17799

TURBOFAN ENGINES
Design and performance of turbofan engines
[AD-683118] p0220 N69-26520

TURBOPANS
Noise reduction modifications in JT3D and JT8D gas turbine engine by single stage fan replacements
[SAE PAPER 730346] p0187 A73-34694

TURBOGENERATORS
USAF Advanced Solar Turbo Electric Concept /ASTEC/ for space vehicle power requirements
p0023 A68-20595

Alkali metal Rankine turbogenerator program for space power supplies, discussing power plant design, nuclear reactor, radiator materials, etc.
p0139 A68-45718

Organic Rankine cycle system using heat absorption from turbine exhaust to provide increased electrical output and to power air conditioning
p0162 A69-42267

Rankine cycle turboelectric nuclear space power conversion system with liquid K as working fluid, discussing current technology status
[GESP-623] p0174 A71-33525

Brayton cycle solar dynamic turboalternator space electric power system technology developments during 1962-1972, considering power efficiency, components reliability and future missions
p0185 A73-25982

A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.
p0186 A73-25984

Isotope organic Rankine cycle electric power systems for the 150 to 1500 watt range.
p0189 A73-38414

Principles, characteristics, and technology development status of conversion systems for converting reactor heat into space electric power
[NASA-TM-X-52472] p0204 N68-29921

Turbine performance in gas-bearing Brayton cycle turboalternator
[NASA-TM-D-5604] p0227 N70-14220

Comparison of turbo-MHD cycle with Brayton-MHD and turboelectric cycles
[NASA-TM-X-67829] p0241 N71-24578

TURBOJET ENGINES
Nitrogen oxide turbojet emissions minimization with hydrogen compared to kerosene /JP/ fuels due to flammability limits, burning velocity and introduction in combustor as gas
p0116 A73-37498

Comparison of ASTM-A1 liquid fuel and natural gas fuels in annular turbojet combustor at Mach 3
[NASA-TM-X-52700] p0087 N70-12102

Conversion of experimental turbojet combustor from ASTM A-1 fuel to natural gas fuel
[NASA-TM-X-2241] p0094 N71-20533

- Comparison of combustion characteristics of ASTM
A-1, propane, and natural gas fuels in annular
turbojet combustor
[NASA-TN-D-7135] p0104 N73-16771
- TWO DIMENSIONAL FLOW**
Numerical calculations of electrical parameters in
Faraday-type EHD generator with two dimensional
gas flow
[IHR-1199] p0241 N71-27207
Experimental investigations of two-dimensional
flow problems and electric power generation in
open cycle vortex MHD generator
[BM-RI-7699] p0251 N73-14746
- TWO PHASE FLOW**
Two phase MHD generator with gas in liquid metal
emulsions, discussing loops efficiency
p0147 A69-27479
Energy conversion with liquid metal working fluids
in MHD generators, discussing single stage fully
Carnotized process
p0147 A69-27482
Liquid metal two phase flow MHD generators
efficiency prediction, discussing end losses and
flow velocity
p0188 A69-27485
Axial pressure, electric current and potential
distribution in two-phase particulate
electroquasidynamic flow, discussing space charge
electric field effect
p0170 A70-40257
Electrical conductivity of two phase liquid metal
flow in magnetohydrodynamic generator
[NASA-CR-97872] p0209 N69-13240
Experimental results on two phase supersonic
nozzle used in liquid metal magnetohydrodynamic
generators
[NASA-CR-97877] p0209 N69-13287
Theoretical analysis and experimental verification
of two phase heat transfer characteristics of
combined solar collector-ammonia generator for
solar air conditioner
p0053 N69-17227
Magnetohydrodynamic generation of electricity by
means of liquid metals using two phase flow
[TH-69-E-06] p0222 N69-31249
MHD power systems with potential high efficiencies
of constant liquid velocity, two phase, liquid
metal dc MHD generator
[AD-747323] p0250 N73-12060
- TWO STAGE TURBINES**
Two stage gas turbine engine optimal tuning for
RPM, thrust, fuel rate and gas temperature,
describing automated bench tests
p0170 A70-43361

U

U.S.S.R.

- Gravimetric surveys of Monzhukly structure in
relation to oil and gas deposits
[ACIC-TC-1247] p0078 N68-10240
Developing and improving energy conversion
efficiency, electrification, and electric power
transmission in U.S.S.R.
[R-7428] p0011 N68-35752
Technological level and production of atomic
industry in U.S.S.R. and other nations
[NIC-TRANS-2653] p0011 N68-38243
Transactions on Soviet mining thermophysics, and
economics of extracting and using thermal energy
sources
p0089 N70-16584
Thermal water resources in Transcarpathin region
of Ukraine
p0090 N70-16586
Temperature measurements and thermal energy
potential of deep boreholes in petroleum-bearing
regions of Ukraine
p0090 N70-16587
Soviet Bloc research on petroleum refining and
additive properties
[AD-700689] p0093 N70-35477
Recent Soviet investigations in geothermy
[AD-750128] p0104 N73-15454
Physical and chemical energy sources for earth,
sea, and space
[AD-753828] p0020 N73-18093

ULTRAHIGH FREQUENCIES

- Detection and monitoring of oil slicks on sea
surface using four frequency radar system
p0097 N72-12311

ULTRASONIC TESTS

- Ultrasonic instrumentation for incipient boiling
detection in liquid metals or fused salts
[NYO-3622-10] p0190 N68-10758

ULTRASONICS

- Thermoelectric generator design using ultrasonic
atomizing burner and SiGe converter
p0121 A68-17827
Ultrasonic energy effects on flow rate of crude
oil through porous sandstone
p0092 N70-25326

ULTRAVIOLET RADIATION

- Secondary ionisation and its possible bearing on
the performance of a solar cell.
p0040 A73-12048

UNDERWATER PROPULSION

- Incore thermionic reactor application to meet
European TV broadcasting satellite and submarine
and underwater laboratory power requirements
p0181 A72-36166

UNDERWATER TESTS

- Undersea warfare energy systems of extended
endurance
[AD-681068] p0217 N69-20548

UNDERWATER VEHICLES

- Comparison of Brayton cycle power plant and fuel
cell for underwater vehicles
[AD-709387] p0238 N70-42951

UNITED NATIONS

- Exploration of nonagricultural earth resources of
economic significance by United Nations in
developing countries
p0099 N72-23295

UNITED STATES OF AMERICA

- Book on solar cells U.S. patent literature,
discussing Si semiconductors, panel fabrication
techniques, photoemissive devices, Cd, Ga and
organic compounds, etc
p0032 A70-22050
Outer continental shelf lands of United States -
Vol. 1, international considerations and federal
jurisdiction
[PB-188714] p0014 N70-25747
Outer continental shelf lands of United States -
Vol. 2, legal and resource aspects
[PB-188715] p0014 N70-25748
Outer continental shelf lands of United States -
Vol. 3, resource aspects, user interaction and
environmental impact, analyses
[PB-188716] p0014 N70-25749
Outer continental shelf lands of United States -
Vol. 4, appendices on legal matters
[PB-188717] p0015 N70-25750
Outer continental shelf lands of United States -
Vol. 5, appendices including bibliography,
questionnaire to industry, oil and gas lease
notices, and comparative laws and policies
[PB-188718] p0015 N70-25751
Outer continental shelf lands of United States -
Vol. 6, appendices including offshore mineral
leasing acts, foreign laws and policies, and
compilation of alternatives
[PB-188719] p0015 N70-25752
Review and comparison of energy forecasts for
United States of America
[PB-189938] p0015 N70-37303
Energy sources in US to achieve future electric
energy needs and environmental compatibility
requirements
p0095 N71-29852
Generation, transmission, and utilization of
energy in United States of America
p0018 N72-23948
Hearings concerning energy problems of US
p0021 N73-23969
- UNMANNED SPACECRAFT**
Unmanned reactor-thermoelectric systems for
applications in the 1970's.
p0186 A73-26024
- URANIUM**
Titration method for uranium concentration
analysis in solutions of irradiated fuel
reprocessing plants
[CNEA-192] p0079 N68-17192

- Analysis of trend in free world atomic power generation, uranium production, resources, and requirements until 1985
[ORNL-TR-1825] p0081 N68-28954
- Program for assessment of natural uranium consumption of different types of thermal reactors
[RISO-M-684] p0082 N68-33991
- Fuel cycle cost comparisons for low enriched uranium
[ORNL-TM-2173] p0083 N69-17558
- Gamma ray logging in uranium prospecting
[SM-112/15] p0084 N69-30790
- Uranium fueled fast steam cooled reactors in SNEAK series
[EUFNR-608] p0085 N69-31161
- Background information on uranium enrichment for nuclear fuel including costs, operations, and equipment
[ORO-668] p0086 N69-31272
- Volatility fluoride processing of plutonium and uranium from fission products - materials recovery, nuclear fuel elements, fluidized bed processors, and fluorination chemistry
[CONF-680610] p0087 N69-37355
- Radon daughter equilibrium measurements in uranium mine atmospheres
p0088 N70-14317
- Abstracts for symposium on uranium plasma research
[NASA-CR-107857] p0229 N70-17651
- Metallic uranium fueled pressurized water reactors for production of process heat or electric power
[ORNL-TM-2451] p0232 N70-25646
- Facility for uranium enrichment by thermal diffusion
[NP-18173] p0093 N70-37298
- Pilot plant for demonstrating nozzle separation method for uranium enrichment
[NP-TR-1884] p0094 N70-39255
- Uranium plasmas applied to nuclear rocket engines, MHD generators, nuclear lasers, and plasma stability and flow - conference
[NASA-SP-236] p0242 N71-33626
- Performance of helium seeded with uranium in magnetohydrodynamic generator
p0243 N71-33663
- Statistical analysis of world reserves of solid fuel, crude oil, uranium, and natural gas in year 2000
[NLL-TRANS-1166-(9022.9)] p0096 N71-35501
- Statistical data compilation of historical facts and figures and current status of US uranium industry as of 1-Jan 1971
[TID-25814] p0099 N72-20472
- Uranium market affecting prices and nuclear power plant use
[NP-19069] p0099 N72-20603
- Aerial 35mm color photography for reconnaissance uranium exploration and soil and rock identification in Wyoming Tertiary basins
p0100 N72-26334
- URANIUM ALLOYS**
Nonaqueous fuel processing based uranium alloys and breeder reactor fuels
[ANL-TRANS-704] p0984 N69-25563
- URANIUM CARBIDES**
Uranium carbide preparation from uranium tetrafluoride, ammonium diuranate, and uranium trioxide studied to optimize production
[AI-CE-73] p0078 N68-11281
- Economic fabrication of nuclear fuel-uranium monocarbide for reactors
[EUR-4273.01] p0086 N69-34967
- URANIUM COMPOUNDS**
Uranium mononitride as nuclear reactor fuel for space vehicle power supply applications, discussing fabrication techniques and irradiation behavior
p0074 A72-22406
- URANIUM OXIDES**
Equilibrium fuel cycle costs for low-enriched, unclad, helium cooled, uranium oxide graphite reactor
[ORNL-TM-1789] p0078 N68-12420
- Cost estimates for preparation and fabrication of solid-gel metal-clad uranium and plutonium oxide fuel elements
[ORNL-TM-1979] p0078 N68-12553
- Energy conversion in vapors ionized by fission products
p0196 N68-17808
- Fuel treatment by selective volatilization of uranium and plutonium fluorides
[CEA-CONF-1195] p0083 N69-25510
- Nuclear grade uranium dioxide powder production technology in Australia
[CONF-690815-3] p0090 N70-17649
- Research in Japan for developing fast reactor mixed oxide nuclear fuels
[NLL-DOUNRE-TRANS-419-/9091.9F/] p0091 N70-21080
- Cost analysis for reprocessing of irradiated plutonium and uranium mixed oxides
[CEA-CONF-1534] p0093 N70-39139
- URBAN DEVELOPMENT**
Lunatic architecture for urban housing
[NASA-TT-F-14963] p0068 N73-26976
- URBAN PLANNING**
Gas turbine power plants in future urban energy planning
[RE-439J] p0253 N73-22912
- URBAN TRANSPORTATION**
Propulsion systems for low emission urban vehicles and analysis of exhaust emissions from fossil-fueled heat engines
[PB-200144] p0097 N72-10830
- Use of energy in transportation and implications for future
[P-5025] p0113 N73-33921
- UTAH**
Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1
[EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367
- Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2
[EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368
- UTILITIES**
Utility needs and reliability of operational fast breeder reactors
p0087 N69-35243
- UTILIZATION**
Thermonuclear reactions for electric power production
[AD-691465] p0225 N69-40792
- Conference on use of solar energy in Mediterranean
[BULL-22] p0069 N73-33762
- Heliotechnique for utilizing solar energy on earth
p0069 N73-33763
- V
- VACUUM CHAMBERS**
Design and performance of two vacuum chambers and solar-radiation simulators for solar-cell research
[NASA-TM-Y-1503] p0047 N68-16695
- VACUUM DEPOSITION**
CdTe thin film fabrication by direct synthesis of vacuum evaporated Cd and Te, noting solar cell efficiency increase after storage in room temperature exsiccator
p0045 A73-30475
- VACUUM EFFECTS**
High temperature and vacuum solar furnace processing of refractory metals in space or on moon
p0039 A72-37675
- VACUUM PUMPS**
Application of explosive driven magnetohydrodynamics for producing pulses at multimegajoule levels
[AD-735660] p0247 N72-21497
- VAPOR DEPOSITION**
Thermionic converter with chloride vapor deposited tungsten emitter and nickel collector
[NASA-CR-1416] p0222 N69-32553
- VAPORIZING**
Cooling system based on vaporization of solar cell preheated solution drawn through chamber with atomizing injector
p0037 A72-24314
- Fuel treatment by selective volatilization of uranium and plutonium fluorides
[CEA-CONF-1195] p0083 N69-25510
- Cost estimates of oxygen blast enrichment of lignite during gasification
p0117 N70-10885

VEGETATION GROWTH

Aerial photographic analysis of effects caused by coal combustion induced pollutants on Eastern white pine and vegetation

p0101 A72-29363

VEHICLES

Minimal energy stochastic controller design for electrically driven vehicles, using dynamic programming

p0177 A72-17304

VELOCITY DISTRIBUTION

Three phase high temperature liquid metal induction MHD generator performance, noting velocity profile nonuniformity influence

p0151 A69-27513

VENTS

Fuel capsule vent system development for the Viking radioisotope thermoelectric generator.

p0077 A73-40766

VIBRATION TESTS

Preliminary design, fabrication, and test of lightweight solar panel of built-up beryllium structure with 29 sq ft active cell area [NASA-CR-117349]

p0061 A71-20727

VIKING MARS PROGRAM

Fuel capsule vent system development for the Viking radioisotope thermoelectric generator.

p0077 A73-40766

VIRUSES

Monitoring and evaluation of water quality, ice cover on Great Lakes, spread of crop viruses, and damage to strip mining areas

p0101 A72-29317

VISCOSITY

Viscosity-temperature chart for hydrocarbons permitting linear extrapolations into low viscosity high temperature regions

p0072 A69-23975

Electrofluid dynamic energy conversion processes using viscous coupling between neutral molecules and electrically charged particles

p0198 A68-17815

VOLATILITY

Influence of volatile fuel components on vehicle emissions [BM-RI-7291]

p0117 A70-20511

VOLCANOLOGY

Geological analysis of aerial thermography of the Canary Islands, Spain.

p0077 A73-39896

VOLT-AMPERE CHARACTERISTICS

I-V characteristics of water cooled MHD generator stressing metal electrode performance

p0127 A68-23925

Thermally regenerative Li-Sn cell with immobilized fused salt electrolyte, discussing current density-voltage curves for various operating conditions

p0137 A68-42517

Liquid metal induction MHD generator I-V characteristics at no load permitting self excitation with capacitors

p0151 A69-27509

Laboratory device for investigating thermionic energy converters and measuring current-voltage characteristics by static/dynamic methods

p0156 A69-34700

Shadow effects on current-voltage characteristics of solar cell array circuits, developing mathematical models

p0028 A69-35709

Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc

p0028 A69-42271

Hot spot failure modes in solar cell arrays noting protection through I-V characteristic control

p0028 A69-42273

Current-voltage characteristics of cascaded solar thermoelectric generator, determining optimum hot junction temperature as function of radiation concentration

p0030 A70-10752

MHD generator cathode current-sheath voltage characteristics for thermionic arc spot emission mode, noting role of cathode temperature [ASME PAPER 69-WA/HT-51]

p0163 A70-14797

Performance degradation in cadmium sulfide solar cells, discussing cause identification technique, I-V curve parameter changes, etc

p0031 A70-15329

Photoelectric composite multicell solar generator, deriving empirical equation for external I-V characteristic

p0031 A70-19623

Plasma inhomogeneities effects on MHD generators I-V characteristics, energy conversion efficiency and optimum duct geometry

p0167 A70-39636

Pulsed MHD generator model with nonequilibrium plasma, obtaining I-V characteristics

p0174 A71-35273

German monograph on thermionic power supply equipment converter network reliability covering I-V characteristics and failure probability calculation

p0177 A72-15696

Solar photosensitive elements prepared p-type GaAs liquid epitaxy on n-type GaAs substrate, measuring dark and light I-V characteristics and spectral response

p0039 A72-30225

Solar cell graded band gap materials, determining I-V characteristics, junction capacitance and photovoltaic spectral response

p0040 A73-14207

High efficiency Cu₂S-CdS-solar cells with improved thermal stability.

p0041 A73-14216

New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell.

p0041 A73-14220

Fabrication criteria, mission design factors and I-V characteristics of Li solar cells

p0041 A73-14242

A system for the evaluation of solar cell samples.

p0042 A73-22438

Performance studies on a rechargeable hydrogen-oxygen fuel cell.

p0186 A73-25988

Volt-ampere characteristics of MHD channel with different electrodes [SM-74/209]

p0211 A69-13332

Photovoltaic solar energy conversion

p0058 A70-30228

Design of solar array simulators used in ground tests of spacecraft power supply systems

p0064 A72-31077

VOLTAGE CONVERTERS (DC TO DC)

High-efficiency converter and battery charger for an RTG power source.

p0190 A73-42906

VOLTAGE REGULATORS

Hydrazine-fueled battery low power consumption auxiliary system with voltage regulator and gas pumps

p0170 A70-43539

Satellite power supply control systems analysis of solar cell array battery

p0047 A68-18466

Breadboard model of Brayton cycle alternator and voltage regulator-exciter [NASA-TN-D-4697]

p0204 A68-29960

Design and testing of 1200-Hz alternator and voltage and frequency controls for Brayton space power systems

p0205 A68-31042

Spacecraft power supply design with emphasis on converter design

p0057 A70-24832

Feedback controlled dc to dc converter with input/output isolation for voltage regulation [NASA-CASE-HQN-10792-1]

p0248 A72-27230

VORTEX GENERATORS

Experimental investigations of two-dimensional flow problems and electric power generation in open cycle vortex MHD generator [BM-RI-7699]

p0251 A73-14746

W

WALL FLOW

Conducting wall MHD generator channel current distribution, examining computer program for anode and cathode currents

p0169 A70-40013

SUBJECT INDEX

WIND (METEOROLOGY)

- Effect of wall friction on magnetohydrodynamic generator performance determined by introduction of wall friction factor into one-dimensional generator equations
[NASA-TN-D-6804] p0247 N72-24755
- WALL TEMPERATURE**
Performance comparison of diagonal conducting wall MHD generator and Hall generator of equal dimensions, investigating wall temperature effect
p0169 A70-40004
- WANKEL ENGINES**
Comparison of Wankel engine characteristics with small reciprocating and jet engines used as power plants in light aircraft
[REPT-908] p0247 N72-20764
- WARFARE**
Undersea warfare energy systems of extended endurance
[AD-681068] p0217 N69-20548
- WASTE DISPOSAL**
Ecological significance of utilization of waste heat generated by rubbish combustion, industrial furnaces, electrical fixtures and human beings
p0071 A68-21940
Method for handling large volumes of solid wastes in future
[CONF-691108-2] p0015 N70-37081
- WASTE UTILIZATION**
Ecological significance of utilization of waste heat generated by rubbish combustion, industrial furnaces, electrical fixtures and human beings
p0071 A68-21940
The availability and cost of curium-244 from power reactor fuel reprocessing wastes.
p0077 A73-38430
Fluoride volatility processes for chemical separation and purification of plutonium from waste materials
[RFP-1048] p0080 N68-19265
Coal enrichment wastes suitable for extraction of fuel gas
p0116 N70-10884
- WASTES**
Mapping of anthracite wastes from mining in Pennsylvania
[E73-111071] p0112 N73-33264
- WATER**
Medium temperature fuel cells advantages including improved electrochemical reaction kinetics, water and heat removal
p0156 A69-32417
Thermal water resources in Transcarpathin region of Ukraine
p0090 N70-16586
Nuclear energy in hydrogen production by water dissociation method
[EUR-4838] p0020 N73-15699
- WATER COOLED REACTORS**
IV characteristics of water cooled MHD generator stressing metal electrode performance
p0127 A68-23925
- WATER FLOW**
Geothermal energy extraction from hot rocks via deep dry wells by pressurized water circulation, solving numerically fluid flow, heat transport and rock fracture equations
p0075 A73-16382
- WATER POLLUTION**
Buffalo photographic aircraft for oil slick remote sensing, using aerial cameras and thermal IR scanner
p0074 A72-16600
Trace element characterization in oil polluted water by neutron activation analysis
p0088 N70-15236
Oil spill incidents and oil pollution effects on biological systems and earth ecology bibliography
[PB-188206] p0014 N70-21569
Senate subcommittee hearings on air and water pollution, including data on noise pollution and automobile fuel research
p0016 N70-41770
Senate subcommittee hearings on air and water pollution, including data on air quality standards and gasoline additive developments
p0016 N70-41771
- Aerial reconnaissance of oil spill in Gulf of Mexico with photographic, infrared and radar type systems
[NASA-CR-117497] p0095 N71-21304
Measures for providing financial responsibility liability limitations for vessels and onshore and offshore facilities in oil pollution cases
[PB-198775] p0017 N71-32620
Legal, economic, and technical aspects of liability and financial responsibility of oil pollution
[PB-198776] p0017 N71-32625
Detection and monitoring of oil slicks on sea surface using four frequency radar system
p0097 N72-12311
Application of radiometric remote sensors for detecting oil slicks on water surface
[AD-728551] p0098 N72-14402
Effectiveness of remote sensor techniques for detecting oil films on water surface
[AD-728422] p0098 N72-14478
Monitoring and evaluation of water quality, ice cover on Great Lakes, spread of crop viruses, and damage to strip mining areas
p0101 N72-29317
Excitation and fluorescence spectra for identifying Navy fuel and fuel oils in sea water
[AD-743703] p0102 N72-33736
Digital analysis of ERTS-1 data to determine sedimentation levels in Potomac and Anacostia Rivers confluence and strip mining in Allegheny County, Maryland
[PAPER-E13] p0110 N73-28277
- WATER TREATMENT**
Analysis of rate of oxidation of petroleum products in water under conditions where nitrogen, phosphorous, and potassium are present
[NLL-NTIC-TRANS-2474-(618C.59)] p0097 N71-37701
- WAVE PROPAGATION**
Seismic wave propagation used in prospecting for oil fields and minerals
p0089 N68-17607
- WAVEFORMS**
MHD generator design with electric conductivity waveform at small magnetic Reynolds numbers
p0156 A69-29911
- WEATHER STATIONS**
Thermoelectric generation of isotopic electric power for radio meteorological stations
p0201 N68-21974
- WEIGHT ANALYSIS**
Computer estimates of weight, cost, and reliability of six battery configurations
[NASA-CR-122296] p0266 N72-11982
Weight estimation and analysis of major structural components of hypersonic, liquid hydrogen fueled aircraft
[NASA-TN-D-6692] p0118 N72-18911
- WELD TESTS**
Selection of materials and techniques for solar array design
[ESRO-CR-12] p0058 N70-30180
- WELDED JOINTS**
Development of a lightweight body-mounted solar cell array with a high power to weight ratio.
p0046 A73-38408
- WELDING MACHINES**
Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- WELLS**
Seven kilometer oil drilling rig
p0092 N70-24796
- WEST VIRGINIA**
BREP imagery for detection of strip mines and reclamation activities in Ohio, West Virginia, and Pennsylvania
[E73-10731] p0108 N73-26337
Skylab monitoring of surface mining activities and reclamation in Ohio, West Virginia, Pennsylvania, Indiana, Kentucky, and Illinois
[E73-11033] p0112 N73-31337
- WIND (METEOROLOGY)**
Energy conversion and electric power plants for developing countries
p0093 N70-38878

WIND EFFECTS

SUBJECT INDEX

- Automatic connection of aerogenerator to electrical network
[NASA-TT-F-14873] p0106 N73-21238
- Functional characteristics and operating data of experimental, aerodynamic three-phase electric power plant constructed in Crimea
[NASA-TT-F-14933] p0107 N73-24268
- Design, development, and performance tests of wind driven, propeller operated electric generation station
[NASA-TT-F-15037] p0110 N73-29004
- State-of-the-art techniques for harnessing solar and wind power
[AD-765783] p0069 N73-33011
- WIND EFFECTS**
- Series of no-contact synchronous generators with outputs up to 100 kV for wind-driven electric units
[AD-742641] p0101 N72-31082
- Design and cost estimate of high altitude wind power plant
[NASA-TT-F-14903] p0107 N73-23011
- Development and construction of wind driven electric power generators for specific European areas
[NASA-TT-F-15050] p0111 N73-29009
- Degradation, dispersion and movement of oil slicks by wind and ocean as factors influencing applicability of countermeasures
[WMO-359] p0112 N73-32300
- WIND PRESSURE**
- Design, development, and performance tests of wind driven, propeller operated electric generation station
[NASA-TT-F-15037] p0110 N73-29004
- Development and construction of wind driven electric power generators for specific European areas
[NASA-TT-F-15050] p0111 N73-29009
- WIND VELOCITY**
- Steel construction design parameters for building and operating ZYKLON type wind driven power plants
[NASA-TT-F-14872] p0106 N73-21253
- WINDPOWERED GENERATORS**
- Design, development, and operation of windpowered electric generators for commercial electric power applications
[NASA-TT-F-15068] p0111 N73-29008
- Development and construction of wind driven electric power generators for specific European areas
[NASA-TT-F-15050] p0111 N73-29009
- Development of aerodynamic transmission system for use with wind driven electric generators
[NASA-TT-F-15131] p0111 N73-30976
- WIRE WINDING**
- Rotating electrical machine superconducting field winding design requirements in terms of size, magnetic energy storage, power level, rotation speed and pole number
p0102 A73-11828
- WOOD**
- Research projects in energy sources, energy development, and exploitation
[ORNL-EIS-72-18-VOL-1] p0018 N72-25635
- WORK FUNCTIONS**
- Schottky barrier diodes microwave power rectification efficiency, developing diode losses theory based on back capacitance, series and front resistance and knee voltage
p0164 A70-21274
- WORKING FLUIDS**
- Diluent gas effect on alkali metal seeded rare gas nonequilibrium plasmas conductivity at various pressures, noting working fluid suitability in MHD generators
p0123 A68-20829
- Electrofluid dynamic energy conversion processes for direct power generation, discussing performance characteristics, working medium properties, etc
[AGARDOGRAPH 81] p0124 A68-22534
- Unipolar ions or charged colloids generation in high speed gaseous working media for electrofluid dynamic energy conversion, discussing corona discharge configurations
[AGARDOGRAPH 81] p0124 A68-22537
- Traveling wave MHD induction generator with variable fluid velocity having rotating machine internal electrical efficiency
[JPL-TR-32-1328] p0133 A68-39723
- Throttling effect on thermodynamic efficiency of MHD generator Rankine cycle with various working fluids
p0134 A68-41271
- Closed-loop cycle converter, composed of MHD generator and compressor consuming thermal energy, exhibiting moderate cycle efficiency decreases
p0134 A68-41272
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 1, Closed cycle MHD with gaseous working fluids
p0001 A69-23433
- Ar-K plasma studied as possible MHD generator working fluid by investigating influence of emission and external magnetic field on nonequilibrium electrical conductivity
p0103 A69-23441
- Argon discharges in metal capillary cathodes noting effects of electron density, flow velocity, electrode phenomena and gas temperature
p0143 A69-23450
- Mercury cesium plasma in crossed electric and magnetic fields as working fluid of MHD generators based on Rankine cycle
p0143 A69-23458
- MHD electrical power generation - Conference, Warsaw, July 1968, Volume 2, Closed cycle MHD with gaseous working fluid
p0003 A69-23464
- Large disk MHD generator operating at high Hall coefficient and driven by cesium seeded argon or molecular gases
p0144 A69-23473
- MHD conversion experiments using rare gas, considering Typhoe loop, electron heating and correction effects
p0144 A69-23475
- Gaseous suspensions of thermionic emitting particles assessed as MHD working fluids in large scale MHD electric power generators
p0146 A69-23491
- Thermal efficiencies of liquid-metal MHD generator cycles, analyzing optimum parameters, working fluid and partial irreversibilities
p0148 A69-27484
- DC MHD generator using gas plasma as working fluid, discussing fundamental principle, components interactions and energy conversion
p0157 A69-39165
- Book on engineering aspects of MHD power generation, discussing working gas ionization and electrical conductivity, incompressible conducting fluid motion in magnetic field, etc
p0165 A70-25525
- Liquid metal MHD power conversion system with Cs and Li as working fluids, describing hydraulic, electrical and high temperature tests results
p0167 A70-39986
- Rankine cycle turboelectric nuclear space power conversion system with liquid K as working fluid, discussing current technology status
[GESP-623] p0174 A71-33525
- Hall current effects in the Lewis magnetohydrodynamic generator.
p0184 A73-22823
- Electromagnetic processes in magnetohydrodynamic induction machines with working media of liquid metal
[NASA-TT-F-460] p0194 N68-16286
- Magnetohydrodynamic induction generators with liquid metal working media, and electromagnetic field structures
p0194 N68-16287
- Radiator design criteria for dynamic converters in which working fluids are condensed directly in radiator tubes
p0195 N68-17796
- Working gas selection for closed Brayton cycle turbocompressor for space power applications
p0196 N68-17802
- Direct electrofluid dynamic energy conversion for space power applications
p0197 N68-17814

SUBJECT INDEX

ZIRCONIUM OXIDES

Performance characteristics of electro-ballistic generators for fluid dynamic energy into electric energy p0198 N68-17816

Ion generation by corona discharge in electrofluid dynamic energy conversion p0198 N68-17817

Phase impedance, power factor, performance characteristics, and working fluids studied for magnetohydrodynamic generators p0204 N68-29990

Helicopter propulsion systems using closed cycle working fluid p0218 N69-23998

Performance of helium seeded with uranium in magnetohydrodynamic generator p0243 N71-33663

WYOMING

Regional environmental impact from oil shale development on private and public lands in Wyoming, Colorado, and Utah - Vol. 1 [EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367

Energy alternatives to prototype oil shale leasing program for Wyoming, Colorado, and Utah - Vol. 2 [EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368

X

X RAY DIFFRACTION

Chemical, X ray diffraction, electron microscopic, and structural analysis of silicon carbide ceramics for open cycle magnetohydrodynamic generators p0243 N71-35623

XENON

Brayton cycle power conversion system using He-Xe gas mixture, discussing compressor net engine and turbine static efficiencies p0175 A71-38908

Y

YTTRIUM-ALUMINUM GARNET

High power giant pulse YAG laser using nonlinear material to achieve complete second harmonic conversion in intracavity experiment p0163 A70-16470

Z

ZINC COMPOUNDS

Spacecraft thermal control coatings development, discussing zinc orthotitanate/silicone properties as solar reflector [ASME PAPER 73-ENAS-7] p0045 A73-37969

ZIRCONIUM COMPOUNDS

Sierra Nevada granite halos in biotite nuclei, discussing relation between biotite zircon content and halo production p0071 A68-23286

ZIRCONIUM OXIDES

MHD power generation, investigating replenishment of zirconia electrodes from plasma in open flame and duct configurations p0166 A70-30535

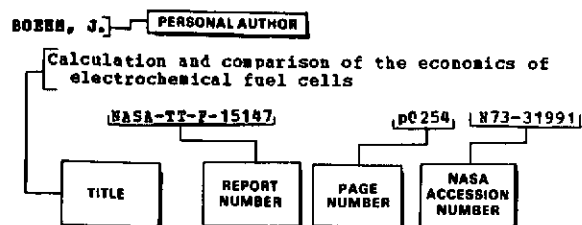
Cubic stabilized zirconia utilization as solid electrolyte in high temperature fuel cell system for efficient and economical energy conversion p0263 A72-33894

PERSONAL AUTHOR INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Personal Author Index Listing



Listings in this index are arranged alphabetically by personal author. The title of the document provides the user with a brief description of the subject matter. The report number helps to indicate the type of document listed (e.g., NASA report, translation, NASA contractor report). The page and accession numbers are located beneath and to the right of the title, e.g., p0254 N73-31991. Under any one author's name the accession numbers are arranged in sequence with the FAA accession numbers appearing first.

A

- ABRITSKA, H. IU.**
Comparison of the characteristics of an ideal MHD induction converter during its pumping and generating modes of operation, taking into account the current conductivity of the channel walls
p0151 A69-28887
- ACKER, R.**
Power systems research at MSFC
p0215 N69-18068
- ACKERMAN, G. B.**
Hydrocarbon fuels for advanced systems
[AD-737372] p0100 N72-23806
- ACKMAN, R. G.**
The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.
p0076 A73-25465
- ADAMS, J. A.**
The potential of magnetohydrodynamic power sources for airborne applications
p0167 A70-33474
- ADAMS, J. B.**
Progress towards a nuclear fusion reactor.
p0142 A69-20124
- ADAMS, L. R.**
Application of isotensoid flywheels to spacecraft energy and angular momentum storage
[NASA-CR-19711] p0266 N72-17020
- ADAMS, R. C.**
Electrode processes in MHD generators.
p0139 A68-43071
- ADGAMOV, R. I.**
Optimization of the tuning of gas turbine engines
p0170 A70-43361
- ADHART, O. J.**
The phosphoric acid fuel cell, a long life power source for the low to medium wattage range.
p0184 A73-22821
- ADLER, R. B.**
Activities concerning electrical, thermal, and optical properties of semiconductors related to energy conversion Final technical report, 15 Jun. 1958 - 30 Nov. 1969
[AD-693235] p0056 N70-11427
- ADLHART, O. J.**
Open cycle fuel cell power plant direct currents, 1.5 KW
[AD-764285] p0254 N73-30979
- AERSCHODT, A. E. V.**
Study of the Cu/x/S barrier layer in Cu-Cd-S solar cells.
p0038 A72-28008
- AFANASEV, M. I.**
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models
p0144 A69-23463
- AFANASYEV, H. I.**
Study of the nonequilibrium conductivity of a plasma in an MHD generator
[SH-74/104] p0210 N69-13324
- AHMAD, H. U.**
Mapping of soil banks using ERTS-1 pictures
p0110 N73-28372
- AKHURST, D. O.**
An analysis of the annular induction MHD generator.
p0139 A68-43072
- Energy transfer problems in superconductors and flowing plasmas Final report
[UAPL-31] p0207 N68-37342
- ALADYEV, I. T.**
The effective electrical conductivity of a two-phase liquid-metal flow
[NASA-CR-97872] p0209 N69-13240
- Investigation of two-phase Laval nozzles
[NASA-CR-97877] p0209 N69-13287
- ALAIS**
Thermoelectric conversion process: Application to radioisotope sources
[FRNC-CONF-13] p0248 N72-28731
- ALAIS, H.**
Thermoelectric generators heated by radioisotopes
p0072 A69-38458
- ALATYRTSEV, G. A.**
Experimental solar thermoelectric generator.
p0030 A70-10751
- ALAVUTDINOV, D. V.**
Double-mirror solar energy concentrators using nickel parabolic reflectors
[AD-741880] p0064 N72-29046
- ALBANY, R. J.**
Thermoelectric radioisotope generators
p0119 A68-14136
- ALBERTSON, D. G.**
The availability and cost of curium-244 from power reactor fuel reprocessing wastes.
p0077 A73-38430
- ALEKSEENKO, G.**
Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- ALEKSEENKO, YU. W.**
Critical experiments with organic moderators - Monoisopropyl diphenyl and gas oil
[FTD-HT-66-746] p0079 N68-12884
- ALEKSEYEV, G. B.**
Direct comparison of various forms of energy into electric and mechanical power
[FTD-MT-64-355] p0203 N68-26786
- ALEXANDER, A. D., III**
Economic study of future aircraft fuels (1970-2000)
[NASA-TM-X-62180] p0102 N72-32742
- ALEXANDER, S. S.**
The use of ERTS-1 MSS data for mapping strip mines and acid mine drainage in Pennsylvania
[PAPER-E3] p0110 N73-28267
- Acid mine drainage and strip mines
[E73-11112] p0112 N73-33269
- ALFREDSOHN, P. G.**
The production of nuclear grade uranium dioxide powders from Australian ores
[CONF-690815-3] p0090 N70-17649

- ALIMOV, A. K.**
Double-mirror solar energy concentrators using nickel parabolic reflectors
[AD-741880] p0064 N72-29046
- ALLEN, K.**
Hydrogen resistojets for primary propulsion of communications satellites.
p0009 A73-15741
- ALLEN, T. C.**
Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems. Parametric design study of canned ac induction motors
[SAN-679-5] p0205 N68-31544
- ALLISON, H. J.**
Performance studies on a rechargeable hydrogen-oxygen fuel cell.
p0186 A73-25988
- ALLISON, J.**
An improved silicon solar cell - The violet cell.
p0040 A73-14212
- ALLSUP, J. R.**
Emission characteristics of propane as automotive fuel
[BN-RI-7672] p0101 N72-31768
- ALTFLIEDER, K.**
The importance of unconventional methods of energy conversion for developing countries
p0093 N70-38878
- ALTMAN, M.**
Prospects for thermal energy storage
p0263 N68-17798
Research in the conversion of various forms of energy by unconventional techniques Status report
[NASA-CR-93979] p0010 N68-21035
Research in the conversion of various forms of energy by unconventional techniques Status report for period ending 30 Jun. 1968
[NASA-CR-97473] p0207 N69-10111
Conservation and better utilization of electric power by means of thermal energy storage and solar heating
[EB-210359] p0065 N73-10976
- ALTOV, V. A.**
Pulse MHD generator with a superconducting magnetic system
p0120 A68-16523
A pulsed magnetohydrodynamic generator with a superconducting magnetic system.
p0131 A68-30774
- ALTURKI, Y. I.**
Application of gas chromatography and mass spectrometry to porphyrin microanalysis - A study of homologous porphyrin series in ancient biological residues
p0073 A70-12516
- AMATO, R. V.**
Study of application of ERTS-1 imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10064] p0102 N72-32336
Study of the application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10193] p0102 N73-10372
Study of application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10371] p0105 N73-19366
Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10776] p0108 N73-27252
Application of EREP imagery to fracture related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277
Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-10970] p0111 N73-30311
- ANASTASIA, L. J.**
Work plan for continuation of the project reduction of atmospheric pollution by the application of fluidized bed combustion
[ANL/ES-CEN-1063] p0096 N71-36736
- ANDERSON, A. F.**
A review of the critical aspects of superconducting a.c. generators.
p0182 A73-11833
Recuperator development program, solar Brayton cycle system Final design report
[NASA-CR-178945] p0057 N70-24627
- ANDERSON, D.**
Turbojet emissions - Hydrogen versus JP.
p0116 A73-37498
- ANDERSON, J. L.**
Nuclear air cushion vehicles.
p0187 A73-32194
Emerging needs for mobile nuclear powerplants
[NASA-TM-X-68164] p0020 N73-15693
Air-cushion tankers for Alaskan North Slope oil
[NASA-TM-X-2683] p0258 N73-18981
- ANDERSON, M. K.**
Energy transfer problems in superconductors and flowing plasmas Final report
[UAPL-31] p0207 N68-37342
- ANDERSON, T. D.**
A study of metallic uranium fueled pressurized water reactors for the production of process heat or electric power
[ORNL-TM-2451] p0232 N70-25646
- ANDERSON, W. A.**
Schottky barrier diodes for solar energy conversion.
p0042 A73-16816
- ANDROPOV, V. G.**
Electrophysical and radiative properties of a nonequilibrium argon-potassium plasma as a possible working fluid for an MHD generator
p0143 A69-23441
- ANGELINO, G.**
The potential role of jet compression in high temperature energy conversion.
p0179 A72-27724
- ANISIMOV, V. M.**
Fuel cells and prospects for their use in railroad transportation
[AD-747512] p0250 N73-13056
- ANTALOVICH, J. W.**
Mapping of soil banks using ERTS-1 pictures
p0110 N73-28372
- APPARAO, T. A. P. S.**
Gas turbine cycle calculations - The effects of fuel composition and heat of combustion
p0073 A70-43439
- APPELDOORN, J. K.**
The lubricity characteristics of heavy aromatics.
p0071 A68-41768
- APPERSON, J. L.**
Large area solar array Quarterly report - Phase 2, 1 Mar. - 31 May 1968
[NASA-CR-95999] p0051 N68-31404
- APPLETON, A. D.**
A review of the critical aspects of superconducting a.c. generators.
p0182 A73-11833
- APPUN, P.**
Induction phenomena in MHD converters with constant and travelling magnetic field.
p0147 A69-25399
Cylindrically constructed MHD induction converters.
p0150 A69-27505
- ARAZMEDOV, B.**
Optimum operating conditions of a solar thermoelectric generator with thermal contacts
p0027 A69-32797
- ARDEHA, M. D.**
Structural weight analysis of hypersonic aircraft
[NASA-TN-D-6692] p0118 N72-18911
- AREFEV, K. M.**
Fundamentals of thermionic and magnetohydrodynamic energy conversion
p0172 A71-26099
Principles of thermoelectronic and magnetohydrodynamic conversion of energy
[AD-748707] p0250 N73-13061
- ARGYROPOULOS, G. S.**
Progress in analytical modeling of MHD power generators.
[AD-741173] p0179 A72-29355
- ARIPOV, U. A.**
Matching a thermionic converter with a solar cell in a solar power array
[AD-704002] p0059 N70-36227

- ANKER, A. J.**
Multihundred watt radioisotope thermoelectric generator /MHW-RTG/
p0176 A71-38927
The multi-hundred watt RTG - Technology background and flight systems program.
p0189 A73-38418
- ARNAS, O. A.**
Infinitely segmented electrodes - Magnetothermoelectric devices.
p0119 A68-11941
- ARNO, R. D.**
Laser energy transfer - An analytic survey of high power applications.
p0257 A73-22822
- ARRANCE, F. C.**
Separator materials for long life, high rate thermal cells.
p0261 A68-42515
- ASINOVSKI, E. I.**
Pulse MHD generator with a superconducting magnetic system
p0120 A68-16523
A pulsed magnetohydrodynamic generator with a superconducting magnetic system.
p0131 A68-30774
Electrophysical and radiative properties of a nonequilibrium argon-potassium plasma as a possible working fluid for an MHD generator
p0143 A69-23441
- ASTASHENKOV, P. T.**
The atomic industry [NIC-TRANS-2653]
p0011 N68-38243
- ATHANIS, T.**
Six-converter solar thermionic generator /JG-4/ Quarterly progress report, 1 Jul. - 15 Dec. 1967 [NASA-CR-92586]
p0046 N68-15766
Six-converter solar thermionic generator Final report, 10 Jan. 1967 - 31 Mar. 1968 [NASA-CR-98712]
p0052 N69-14920
- ATKILL, V. H.**
A resource carrying aircraft for remote regions.
p0257 A73-33183
- AU, G. F.**
Kaufman power plants with solar cells - Energy-supply devices for missions in the near future
p0023 A68-15882
- AUSTIN, A. L.**
Survey of hydrogen's potential as a vehicular fuel [UCRL-51228]
p0020 N73-16766
- B**
- BACHER, A. A.**
Ecological significance of waste heat utilization.
p0071 A68-21940
- BACKUS, C. E.**
Laser activation of solar cells.
p0040 A73-14210
Laser activation of solar cells [LA-DC-72-468]
p0065 N73-12061
- BARTSLE, L. H.**
State of development of an actinium fueled thermionic generator.
p0075 A72-36169
Large scale production of Ac-227 and development of an isotopic heat source fueled with Ac203 [A/CONF-49/P/287]
p0098 N72-16196
- BAGOTSKII, V. S.**
The present and future of fuel cells [AD-743651]
p0249 N72-33065
- BAIBUTARY, K. B.**
Calculation of the solar radiation incident on an inclined ribbed surface
p0040 A72-43194
- BAILEY, R. L.**
A proposed new concept for a solar-energy converter. [ASHE PAPER 71-WA/SOL-11]
p0036 A72-15891
Electromagnetic wave energy converter [NASA-CASE-GSC-11394-1]
p0254 N73-32109
- BAKANOV, I. A.**
Investigation of a liquid-metal induction MHD generator
p0151 A69-27513
- BAKANOV, I. A.**
Study of an induction-type liquid-metal MHD generator [NASA-CR-978761]
p0214 N69-13818
- BAKER, P. S.**
Sr 90 heat sources [ORNL-IIC-36]
p0096 N71-35815
- BALOGH, B.**
17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734
- BALUKJIAN, H.**
The 7th Annual Technical Symposium - A closed Brayton cycle power plant for underwater applications and comparison with a fuel cell [AD-709387]
p0238 N70-42951
- BANGERTER, C. D.**
Explosive magnetohydrodynamic program [AD-762934]
p0254 N73-30890
- BAROS, A., JR.**
Seventh International Power Sources Symposium, Brighton, Sussex, 15-17 September 1970 [AD-718833]
p0016 N71-23353
The 5th International Conference on Magneto-hydrodynamic electrical power generation [AD-730450]
p0247 N72-15235
- BARACH, J. P.**
An induction generator experiment.
p0130 A68-29309
- BARAK, M.**
Batteries and fuel cells
p0171 A70-46399
- BARANOV, G. A.**
Experimental investigation of liquid-metal MHD generators
p0151 A69-27512
Experimental investigations on liquid-metal MHD generators [NASA-CR-97879]
p0209 N69-13288
- BARANOV, V. I. U.**
Investigations of high-temperature solar energy absorbers and thermal storage devices.
p0030 A70-10764
Qualitative analysis of MHD energy conversion efficiency
p0186 A73-27321
- BARANOV, V. I. U.**
Electrical arcs in ionized and non-ionized gas streams [SM-74/238]
p0213 N69-13347
- BARNA, G. J.**
Design point characteristics of a 500 - 2500 watt isotope-Brayton power system. [AIAA PAPER 72-1059]
p0182 A73-13388
Isotope Brayton electric power system for the 500 to 2500 watt range.
p0184 A73-22793
Study of a 300-kilowatt Rankine-cycle advanced nuclear-electric space-power system [NASA-TN-X-1919]
p0226 N70-11975
- BARNEA, J.**
The exploration of non-agricultural natural resources in developing countries by the United Nations
p0099 N72-23295
- BARR, W. L.**
Experimental and computational investigations of the direct conversion of plasma energy to electricity [CONF-710607-126]
p0244 N71-38463
- BARRINGER, A. R.**
Correlation spectrometry applied to earth resources
p0099 N72-23284
- BARSELL, A. W.**
Improved technology for multiwatt radioisotope heater units.
p0188 A73-36681
- BARTHELEMY, H. P.**
Power and energy for posterity.
p0037 A72-18627
Power and energy for posterity
p0019 N73-13864
- BARTSCH, G.**
Comparative performance analysis of linear MPD generators [TUBIK-15]
p0234 N70-32771
- BASHILOV, V. A.**
The ENIN-2 experimental open cycle MHD generator rig [AD-751251]
p0251 N73-16036

- BASNETT, D.**
Development status of solar generators based on silicon photovoltaic cells
p0050 N68-28740
- BATHIN, V. H.**
Electrophysical and radiative properties of a nonequilibrium argon-potassium plasma as a possible working fluid for an MHD generator
p0143 A69-23441
- BAUDOUIN, PH.**
Development of a thermophotovoltaic converter [AGARDOGRAPH 81]
p0125 A68-22548
Effect of a thermophotovoltaic converter
p0199 N68-17829
- BAUER, P.**
Batteries for space power systems [NASA-SP-172]
p0265 N69-18042
- BAUM, V. A.**
Semiconductor solar energy converters
p0029 A70-10750
Experimental solar thermoelectric generator.
p0030 A70-10751
Feasible energy and technical characteristics of solar thermoelectric generator /STEG/ with two-stage converter
p0032 A70-32425
High temperature solar furnace [AD-704754]
p0059 N70-32426
- BAUMAN, H. F.**
ROD: A nuclear and fuel cycle analysis code for circulating fuel reactors [ORNL-TM-3359]
p0098 N72-17737
- BAYCE, A. E.**
Some major impacts of the national space program. 4 - Impacts of new materials technology [NASA-CR-96813]
p0011 N68-34388
- BAYER, E.**
Thermal efficiencies of liquid-metal MHD generator cycles.
p0148 A69-27484
- BAYEV, K. A.**
Calculating the index of endogenic inflammability on the basis of heat transfer and thermochemical processes
p0090 N70-16595
- BAZREY, E. T.**
Liquid-metal MHD systems with laminar flow and electric power generation by the synchronous principle
p0148 A69-27491
- BEAM, R. M.**
A solar engine using the thermal expansion of metals.
p0046 A73-38473
Solid medium thermal engine [NASA-CASE-ARC-10461-1]
p0252 N73-20931
- BEARD, D. S.**
Thermionic reactor technology - An overview
p0176 A71-38949
Thermionic reactor program - An overview.
p0184 A73-22815
- BEATTY, R. L.**
Coated-particle fuels [ORNL-4324]
p0083 N69-19605
- BECK, H.**
Aviation fuels and lubricants
p0073 A70-29999
- BECKER, E. W.**
Separation nozzle demonstration plant for uranium enrichment [NP-TR-1884]
p0094 N70-39255
- BECKER, J. V.**
New approaches to hypersonic aircraft [ICAS PAPER 70-16]
p0115 A70-44127
Key technology for airbreathing hypersonic aircraft. [AIAA PAPER 73-58]
p0009 A73-17631
- BECKETT, R. G.**
Fuel related problems in aircraft fuel systems
p0097 N72-11677
- BECKWITH, W. B.**
Future patterns of aircraft operations and fuel burnouts with remarks on contrail formation over the United States.
p0075 A72-28879
- BEER, J. M.**
A combustion oscillator for MHD energy conversion
p0175 A71-38099
- BEGHI, G.**
Hydrogen as an energy vector: New future prospects for applications of nuclear energy [EUR-4838]
p0020 N73-15699
- BEGLEY, G.**
Report of the Ad Hoc Panel on fusion research on low-beta plasmas confined in open-ended geometries [TID-24254]
p0203 N68-29663
- BELEBOV, A. T.**
Empirical equation for the external characteristic of a photoelectric solar generator
p0031 A70-19623
- BELEVTSSEV, A. T.**
Electrodynamic generator
p0131 A68-31227
Electrodynamic generator.
p0140 A69-14153
- BELIKOV, A. G.**
Energy characteristics of a coaxial plasma source.
p0115 A72-26754
- BELL, D.**
Fuel cell technology program
p0237 N70-40974
- BELLANCA, S. C.**
Neutron activation analysis identification of the source of oil pollution of waterways
p0088 N70-15236
- BELLER, M.**
Pollution-free hybrid fossil-nuclear fueled MHD power cycle [BNL-12319]
p0202 N68-26381
Hybrid fossil-nuclear fueled MHD power cycles [BNL-12569]
p0082 N69-11230
- BENELMANS, P.**
Compilation of references on the direct conversion of heat into electrical energy [BLG-427]
p0223 N69-32934
- BENEZECH, G.**
Measurements of temperatures of products treated in a solar furnace by means of IR pyrometers
p0032 A70-32424
- BENNETT, A.**
Thermoelectric nuclear batteries.
p0188 A73-38410
- BENSER, W. A.**
Brayton cycle systems
p0208 N69-12578
- BENTON, M.**
Space vehicle missile power supplies Annotated bibliography [NASA-TM-X-60877]
p0195 N68-17223
- BEREMAND, D. G.**
H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report. [IEEC PAPER 7390281]
p0116 A73-38436
- BERGANINI, D. F.**
Radioisotope power subsystems for space application.
p0119 A68-10231
- BERGER, C.**
Handbook of Fuel Cell Technology.
p0139 A68-44776
- BERGER, M. S.**
Some results of experiments with a 100-kw MHD generator model [SM-74/212]
p0210 N69-13325
- BERGMAN, P. D.**
Economics of mixed potassium-cesium seeding of an MHD combustion plasma [PB-214314/7]
p0253 N73-25112
- BERLANDI, F. J.**
Radioisotopic power generators State of the art report [AD-687131]
p0223 N69-32814
- BERLIN, R. E.**
Solar thermoelectric generator design and panel development program [NASA-CR-72340]
p0006 N68-12252
Flat plate thermoelectric generators for solar probe missions [NASA-TM-X-52451]
p0050 N68-31010
- BERMAN, H. S.**
Study of fabrication techniques for SiC solar cells Final technical report [NASA-CR-73444]
p0059 N70-37465
- BERMAN, F. A.**
Considerations with respect to the design of solar photovoltaic power systems for terrestrial applications [NASA-CR-127031]
p0064 N72-26134

- Photovoltaic solar array technology required for three wide scale generating systems for terrestrial applications: rooftop, solar farm, and satellite
[NASA-CR-128381] p0065 N72-33061
- BERNARD, A. E.
Thermoelectric heating and ventilating system
[AD-737720] p0247 N72-24139
- BERNARD, J.
Study of the electrical behavior of various magnetohydrodynamic generators using explosives
[CEA-R-3714] p0222 N69-30078
- BERNATOWICZ, D. T.
Solar array cost reduction.
p0039 A72-37642
Solar array cost reductions.
p0044 A73-29592
Solar array cost reduction
[NASA-TN-X-68035] p0063 N72-21033
Cost study of solar cell space power systems
[NASA-TN-X-68054] p0063 N72-25022
- BERNIER, M.
Solar generator technology on the Symphonie satellite.
p0042 A73-18976
- BERRY, K. E.
Current distribution in conducting wall MHD generators
p0169 A70-40013
- BERRY, R. E.
SWAP-19 residual fire test
[SC-DR-69-490] p0230 N70-19359
- BERRY, W.
A fuel conservation study for transport aircraft utilizing advanced technology and hydrogen fuel
[NASA-CR-112208] p0102 N73-11019
- BERNIMOV, A. I.
Methods of determining induced magnetic fields in linear DC MHD generators
p0143 A69-23454
- BERTOLINI, E.
Closed cycle M.H.D. experiments with a large blow-down facility.
p0127 A68-23929
Status of the research on closed cycle MHD power generation
[RT/ING-(71)20] p0250 N73-12784
- BERTON, B. C.
Peaceful applications of nuclear explosions: Mines, chemistry, and gas and oil extraction
[CEA-BIB-129-ADD-1] p0104 N73-17719
- BERTRAND, E.
Experimental results of MHD conversion using a rare gas
p0144 A69-23475
- BEZAUDON, J.
Eole balloon solar generators
[NASA-TT-F-13836] p0063 N72-18032
- BEZUSII, L. G.
Liquid-metal MHD systems with laminar flow and electric power generation by the synchronous principle
p0148 A69-27491
- BEZUSII, L. G.
Electrical parameters of a synchronous magnetohydrodynamic generator with pulsating electrical conductivity of medium
[SM-74/210] p0211 N69-13333
- BHATTACHARYA, A. T.
Some problems of lignite gasification by means of high-temperature nuclear reactor heat
[JUL-554-RG] p0264 N69-13298
- BICEVSKIS, A.
EQUICORE - A space dependent code to assess the nuclear and thermal performance of SGHW and similar reactors
[TRG-1808] p0230 N70-22307
- BICHENKOV, E. I.
Explosive generators.
p0120 A68-15139
Flux-compression generators
[UCRL-TRANS-10133] p0192 N68-14541
- BIDARD, R.
Study of two-phase media for use in MHD devices
p0147 A69-27479
- BIENSTOCK, D.
The effect of air/fuel level in the MHD generator on the operation of an open-cycle MHD-topped power plant
p0166 A70-30534
- Experimental investigations of an open-cycle, vortex MHD generator
[BM-RI-7699] p0251 N73-14786
- Economics of mixed potassium-cesium seeding of an MHD combustion plasma
[PB-214314/7] p0253 N73-25102
- BIPANO, G. J.
Hybrid TE panel test results.
p0184 A73-22766
- Parametric analysis of radioisotope thermoelectric generators
[NASA-TN-X-1453] p0193 N68-14630
- Preliminary analysis of a titanium alloy honeycomb solar absorber having blackened walls
[NASA-TN-D-4727] p0050 N68-30751
- Flat plate thermoelectric generators for solar probe missions
[NASA-TN-X-52451] p0050 N68-31018
- BILLAUD, G.
Medium temperature fuel cells
p0156 A69-32417
- BIRNBERGER, H.
State of development of an actinium fueled thermionic generator.
p0075 A72-36169
- BIREVALK, I. A.
End effect in conduction MHD machines in the case of branching of a portion of the current along the channel
p0130 A68-29187
- BISCHOP, F. V.
Space station solar array technology evaluation program
[MSC-07163] p0068 N73-30057
- BISHOP, A. R.
Effect of electrothermal instabilities on Brayton- and Rankine-cycle magnetohydrodynamic space-power generation systems
[NASA-TN-D-5461] p0224 N69-37883
- The performance of helium seeded with uranium in a magnetohydrodynamic generator
p0243 N71-33663
- The effect of wall friction on magnetohydrodynamic generator performance
[NASA-TN-D-6804] p0247 N72-24755
- BITIURIN, V. A.
Determination of the stabilization time of the nonequilibrium state at the entrance to a MHD-generator channel.
p0122 A68-19914
- Influence of leakages on MHD generator characteristics
p0171 A71-12195
- BIXLER, C. H.
MHW converter design and performance summary.
p0189 A73-38419
- BJERKLIE, J. W.
A liquid-metal MHD power generation scheme using intermittent vaporization.
p0149 A69-27492
- BLADE, O. C.
Bureau of Mines - API survey of aviation gasoline, 1969
[SAE PAPER 700228] p0073 A70-25897
- BLAGA, L.
Measurement of isotopic distribution in the evaluation of oil fields
[SM-112/27] p0085 N69-30801
- BLAIR, L. S.
Parametric analysis of radioisotope thermoelectric generators
[NASA-TN-X-1453] p0193 N68-14630
- BLAKE, F. A.
The "hot spot" failure mode for solar arrays.
p0028 A69-42273
Feasibility study of a 30 watts per pound roll up solar array Quarterly technical report, 1 Jan. - 31 Mar. 1968
[NASA-CR-94243] p0048 N68-21879
Feasibility study 30 watts per pound roll-up solar array Final report
[NASA-CR-96230] p0051 N68-32561

- Cadmium sulfide thin film solar cell array
sub-panel development Final report
[NASA-CR-72439] p0051 N68-33207
- BLOCK, H. B.**
Performance of the electrically-heated 2 to 15 kwe
Brayton power system p0173 A71-32212
Isotope Brayton electric power system for the 500
to 2500 watt range. p0184 A73-22793
- BLOKHIN, I. V.**
Development and production of electrical machines
and magnetic systems using superconductors p0173 A71-32274
- BLOM, J. B.**
The effects of electrode configuration on the
performance of a Faraday type MHD generator. p0179 A72-29353
- BLOUGH, J. E.**
Toward a cleaner environment p0094 N70-39314
- BLOUIS, G. B.**
Production of ammonia using low-cost nuclear energy p0117 N70-14512
- BOCKRIS, J. O.**
Electrochemical catalysis.
[AGARDOGRAPH 81] p0261 A68-22542
Electrochemical catalysis p0199 N68-17823
Studies in fundamental chemistry of fuel cell
reactions Semiannual progress report, 1 Jan. -
30 Jun. 1968 [NASA-CR-100892] p0219 N69-25396
- BOCKRIS, J. O.**
Fuel cells- Their electrochemistry p0166 A70-30100
- BOECKE, F., JR.**
Startup testing of the SNAP-8 power conversion
system [NASA-TN-Y-52822] p0233 N70-29864
- BOEHM, H.**
Calculation and comparison of the economics of
electrochemical fuel cells p0185 A73-25346
- BOEHM, J.**
Calculation and comparison of the economics of
electrochemical fuel cells [NASA-TT-P-15147] p0254 N73-31991
- BOEHME, H.-J.**
Optimization of high-temperature fuel cells of a
flat-type design p0170 A70-42499
- BOEHME, R. J.**
Power systems research at NSPC p0215 N69-18068
- BOGART, D.**
Nuclear reactor heat sources for future power
generation p0012 N69-12576
- BOGOMOLOV, V. G.**
Some results of an investigation of a single-
component version of a liquid-metal MHD energy
converter p0148 A69-27488
- BOGOMOLY, B. G.**
Results of research on a single-component system
for a liquid-metal MHD converter [NASA-CR-97883] p0209 N69-13045
- BOGUS, E.**
High efficiency Cu₂S-CdS-solar cells with improved
thermal stability. p0041 A73-14216
- BOHM, T.**
Energy conversion in magnetohydrodynamic /MHD/
generators /Energieumwandlung mit
magnetohydrodynamischen /MHD-/ Generatoren/.
p0121 A68-17797
Applied magnetohydrodynamics, no. 3
[JUL-510-TP] p0201 N68-21331
Applied magnetohydrodynamics. Number 5 -
MHD-nuclear power stations [JUL-689-TP] p0242 N71-30458
Applied magnetohydrodynamics, report no. 10,
MHD-test facility Argas 2: Description and
operations [NASA-TT-P-14876] p0252 N73-22662
- BOHM, TH.**
Applied magnetohydrodynamics, Issue 6 -
Parametric studies and dimensioning of noble gas
MHD generators [JUL-706-TP] p0242 N71-27918
- BOLDYREV, V. M.**
Thermodynamic analysis of new liquid-metal
MHD-generator cycles p0148 A69-27489
Thermodynamic analysis of new cycles for
liquid-metal MHD generators [NASA-CR-97885] p0209 N69-13151
- BOLLENBACHER, G.**
Experimental evaluation of a voltage
regulator-exciter for a 15 kilovolt-ampere
Brayton cycle alternator [NASA-TN-D-4697] p0204 N68-29960
Description and evaluation of digital-computer
program for analysis of stationary outside-coil
Lundell alternators [NASA-TN-D-5814] p0233 N70-28433
- BOLLER, H.-W.**
Solar generators and solar cells p0032 A70-29554
- BOLME, D. W.**
Potential of using mixed fission products as a
source of energy [BNWL-1115] p0224 N69-38506
- BOLSHAKOV, G. P.**
Instrument for studying the oxidizability of
petroleum hydrocarbons at high temperatures
[TG-230-T533] p0079 N68-15844
- BONAL, R.**
The use of thin film solar cells in the
radiovoltaic generators. p0038 A72-28021
Prospects for radiovoltaic energy conversion
p0185 A73-23278
One volt isotopic microgenerators
[CEA-R-3834] p0225 N69-40586
- BOND, J. A.**
The design of components for an advanced Rankine
cycle test facility [GESF-451] p0173 A71-32223
- BONK, S. P.**
Composite flywheel stress analysis and materials
study. p0261 A68-12853
- BONNEFILLE, E.**
Development of a liquid flow MHD alternating
current generator p0149 A69-27495
- BONNER, T. F., JR.**
Potential of hydrogen fuel for future air
transportation systems. [ASME PAPER 73-ICT-104] p0010 A73-43499
- BONNET, D.**
New results on the development of a thin-film
p-CdTe-n-CdS heterojunction solar cell. p0041 A73-14220
- BOODLEY, L. E.**
Connector strips-positive, negative and T tabs
[NASA-CASE-XGS-01395] p0053 N69-21539
- BORDEN, F. Y.**
Identification and mapping of coal refuse banks
and other targets in the anthracite region
[PAPER-L24] p0110 N73-28319
Mapping of anthracite refuse
[E73-11707] p0112 N73-33260
- BORRTE, J. E.**
Candidate electrical power systems for Space Station
[AIAA PAPER 71-825] p0174 A71-34720
Isotope organic Rankine cycle electric power
systems for the 150 to 1500 watt range. p0189 A73-38414
Study to establish criteria for a solar cell array
for use as a primary power source for a
lunar-based water electrolysis system, phase 1
Final technical report, 1 Jul. 1967 - 30 Jun. 1968
[NASA-CR-61979] p0051 N68-36000
Study to establish criteria for a solar cell array
for use as a primary power source for a
lunar-based water electrolysis system, phase 4
[NASA-CR-119945] p0062 N71-36441
- BORRTE, J. E., SR.**
Large solar arrays - The emerging space power
workhorse. p0027 A69-35056

- BORISSOV, IG. YA.**
The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel
p0075 A73-12955
- BOROK, A. M.**
Electroqasdynamic generator with spatial charge neutralization
p0165 A70-27330
Electroqasdynamic generator with neutralization of the space charge
p0170 A70-42071
- BORTNIKOV, IG. S.**
Electroqasdynamic generator
p0131 A68-31227
Electroqasdynamic generator.
p0140 A69-14153
- BORZOV, G. G.**
Development and production of electrical machines and magnetic systems using superconductors
p0173 A71-32274
- BOUNDS, R. W.**
A kilowatt rotary power transformer.
p0178 A72-21414
- BOURGEOIS, M.**
Treatment of fuel by the dry method. Studies performed in France
[CEA-COMF-1195]
p0083 A69-25510
Nonequilibrium fuel processing - Research conducted in France
[ANL-TRANS-704]
p0084 A69-25563
- BOWEN, R. J.**
Optimizing power efficiency of hydrazine-oxygen fuel cells.
p0187 A73-29598
- BOWER, W. K.**
CdS solar cell development Final report
[NASA-CR-72534]
p0054 A69-23369
- BOWKER, I. H.**
The potential of magnetohydrodynamic power sources for airborne applications
p0167 A70-33474
- BOWMAN, R. L.**
Solar absorptances and spectral reflectances of 12 metals for temperatures ranging from 300 to 500 K
[NASA-TN-D-5353]
p0055 A69-31895
- BOYLAN, D. B.**
Application of gas chromatography and mass spectrometry to porphyrin microanalysis - A study of homologous porphyrin series in ancient biological residues
p0073 A70-12516
- BRABERS, H. J.**
Simulations of the radioactive decay of Th-228/ used in the form of ThO₂ as a heat source for thermionic energy conversion.
p0075 A72-36162
Large scale production of Ac-227 and development of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287]
p0098 A72-16196
- BRADLEY, P. G.**
Reward and uncertainty in exploration programs
[NASA-CR-129595]
p0103 A73-13991
Two stochastic models useful in petroleum exploration
[NASA-CR-129611]
p0103 A73-13992
- BRADSHAW, G. B.**
Application of Isotec thermoelectric technology.
p0186 A73-26034
- BRAITHWAITE, J.**
Further infrared systems studies for the earth resources program Final report
[NASA-CR-102111]
p0089 A70-16467
- BRANDHORST, R. W., JR.**
Silicon solar cell efficiency - Practice and promise.
p0039 A72-32131
- BRANDMAYER, H. E.**
MHD power generation using an RF-generated nonequilibrium plasma.
p0133 A68-41161
- BRANDT, R. G.**
Superconducting technology in Japan
[AD-727094]
p0244 A71-38510
- BRAUN, J.**
A supercritical thermodynamic power cycle with MHD generator.
p0156 A69-31914
- BREDELOW, G.**
The electrical conductivity in argon potassium and helium potassium plasmas with elevated electron temperatures in crossed electric and magnetic fields
[IPP-3/59]
p0190 A68-10892
- BREELLE, Y.**
Autonomous hydrogen/air fuel cell for long-life missions.
p0184 A73-22752
Fuel and hydrogen cells
p0116 A73-45025
- BREEV, V. V.**
Certain problems of the efficiency of power production in MHD generators with a nonequilibrium plasma
[IAE-1701]
p0235 A70-33216
Some questions of the effectiveness of the production of electroenergy in MHD-generator in a nonequilibrium plasma
[AD-724973]
p0245 A72-10782
- BREIPEHL, A. E.**
Bayesian decision theory - Promise and problems
p0074 A71-33291
- BREITWIESER, E.**
An out-of-core thermionic-converter system for nuclear space power
[NASA-TM-X-68049]
p0247 A72-23675
- BRESGEN, H.**
Two-dimensional analysis of the MHD generator, taking into account the Hall effect
p0140 A69-14099
- BRIEHL, D.**
Use of an air-assist fuel nozzle to reduce exhaust emissions from a gas turbine combustor at simulated idle conditions
[NASA-TN-D-6404]
p0096 A71-31456
- BRIGGS, D. C.**
High energy density silver-hydrogen cells for space and terrestrial applications.
p0188 A73-38403
- BRISLIN, R. J.**
Thermal steady-state characterization of isotopic radioisotope thermoelectric generator
[ASME PAPER 69-WA/ENER-12]
p0163 A70-14897
- BRISTOW, M.**
The development of an airborne remote laser fluorosensor for use in oil pollution detection and hydrologic studies
[UTIAS-175]
p0099 A72-20479
- BROGAN, T. R.**
The plasma MHD power generator.
p0132 A68-37062
MHD - Where at and where to?
p0139 A69-11394
Comparison of experimental and analytical results for a 20-MW combustion-driven Hall configuration MHD generator
p0168 A70-40003
Comparison of experimental and analytical results for a 20 MW combustion-driven Hall configuration MHD generator
[FR-344]
p0231 A70-24132
Explosive magnetohydrodynamic program
[AD-762934]
p0254 A73-30890
- BRONNER, G.**
Experimental results of a one megajoule inductive energy storage system.
p0261 A68-23903
- BROOKS, R. L.**
Applicability of satellite remote sensing for monitoring surface mining activities
[E73-10731]
p0108 A73-26337
Applicability of satellite remote sensing for monitoring surface mining activities
[E73-11033]
p0112 A73-31337
- BROSE, H. F.**
Hydrogen depolarized cell for a CO₂ concentrator
[ASME PAPER 71-AV-37]
p0174 A71-36404
- BROWN, G. V.**
The practical use of magnetic cooling
p0176 A71-40898
- BROWN, P. E.**
Radioisotopes- Famine of feast - A review of availability
p0074 A71-38948
Compatibility of the MHW-RTG heat source materials.
p0076 A73-38427

The availability and cost of curium-244 from power reactor fuel reprocessing wastes.

p0077 A73-38430

BROWN, R.

Closed-cycle MHD experiments with applied electric and magnetic fields.

p0145 A69-23479

BROWN, W. C.

High power microwave generators of the crossed-field type

p0035 A71-28668

The receiving antenna and microwave power rectification

p0035 A71-28671

Satellite power stations - A new source of energy.

p0043 A73-23601

BRUCKNER, G.

Study to determine and improve design for lithium-doped solar cells Quarterly report, 1 Oct. - 31 Dec. 1970 [NASA-CR-116220]

p0060 N71-16472

BRUCKNER, A., II

A system for the economic analysis of balanced energy conversion and storage systems

p0264 N69-15054

BRYAN, D. E.

Development of nuclear analytical techniques for oil slick identification, phase 1 [GA-9889]

p0094 N71-15083

BUCHHELE, D. E.

Optics at the Lewis Research Center

p0032 A70-23522

BUCHHELE, L.

Construction and test of an MHD generator channel and electrical power converter [AD-758783]

p0253 N73-25106

BUNDS, R.

Solar generators and solar cells

p0032 A70-29554

BULL, O. B.

Magnetic systems using steel for magnetohydrodynamic generators [AD-688393]

p0224 N69-35280

BURGER, J.

Measurements of the potential and current density distributions in a simulated Faraday-type MHD generator working with argon-potassium plasma [JPP-3/104]

p0234 N70-31285

BURLINGAME, A. L.

Analysis of the mineral entrapped fatty acids isolated from the Green River Formation.

p0071 A68-27231

17alpha-H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.

p0076 A73-29734

BURNETT, J. C.

Suppression of evaporation of hydrocarbon liquids and fuels by aqueous films. [WSCI PAPER 72-27]

p0075 A73-16687

BURROWS, L.

Aerodynamic problems in cooled turbine blading design for small gas turbine

p0220 N69-26532

BUSCH, W. S.

Feasibility study 30 watts per pound roll-up solar array Final report [NASA-CR-96230]

p0051 N68-32561

BUSH, D. E.

Advancements in pellet-type thermal battery technology [SC-RR-69-497-A]

p0267 N73-21084

BUSHNELL, C. L.

Pulsed power fuel cells

p0166 A70-27758

BUSSARD, R. W.

Nuclear source limitations for direct conversion devices

p0196 N68-17803

BUSTARD, T. S.

A radioisotope heater for a silver-zinc battery.

p0261 A68-25659

BUT, D. A.

Methods of determining induced magnetic fields in linear DC MHD generators

p0143 A69-23454

BUTCHER, O. C.

Development status of solar generators based on silicon photovoltaic cells

p0050 N68-28740

BOYNITSKAYA, V. I.

Critical experiments with organic moderators - Monoisopropyl diphenyl and gas oil [FTD-HT-66-746]

p0079 N68-12884

BOZNIKOV, A. E.

Experimental investigation of the characteristics of a nonequilibrium MHD generator

p0190 A73-39618

BYBEE, R. C.

Thermal Heliotrope - A passive sun-tracker

p0033 A70-34131

BZHOZOVSKI, V. C.

Studies of electrodes in an MHD generator [SM-74/62]

p0210 N69-13315

C

CAIRNS, E. J.

A lithium/tin cell with an immobilized fused-salt electrolyte - Cell performance and thermal regeneration analysis.

p0137 A68-42517

Fuel Cells and Fuel Batteries- A Guide to their Research and Development.

p0139 A68-44312

Secondary cells with lithium anodes and immobilized fused-salt electrolytes.

p0262 A69-15330

Fuel cells with molten-carbonate electrolytes [REPT.-67-C-210]

p0201 N68-21439

Development of high-specific-energy batteries for electric vehicles

p0267 N73-19661

Lithium/sulfur batteries for off-peak energy storage: A preliminary comparison of energy storage and peak power generation systems [ANL-7958]

p0268 N73-30058

CALDERON, M. O.

Large superconducting baseball magnet, part 1 [UCRL-71010]

p0218 N69-22640

CALDWELL, R. L.

Advances in nuclear geophysical methods in oil geology and rock analysis [SM-112/25]

p0085 N69-30800

CALIPANO, P. P.

Technology and electrical characteristics of gallium arsenide solar cells

p0023 A68-15419

CALLESON, R.

A fuel conservation study for transport aircraft utilizing advanced technology and hydrogen fuel [NASA-CR-112204]

p0102 N73-11019

CALVERT, F. O.

Conceptual design of a five kW radioisotope-fueled power system for terrestrial applications

p0238 N71-11062

CAMMEL, A. B.

The diagnostics of plasmas

p0196 N68-17809

CAMERON, H. M.

H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report. [IECFC PAPER 739028]

p0116 A73-38036

CAMPANILE, A.

Present status of investigations on the heat transfer problems of the earth burial of space radioisotope heat sources [SORIN-T/6011]

p0091 N70-21969

CAMPBELL, R.

Applicability of NASA contract quality management and failure mode effect analysis procedures to the USGS Outer Continental Shelf oil and gas lease management program [NASA-TN-X-2567]

p0100 N72-25955

CAMPBELL, R. B.

Study of fabrication techniques for SiC solar cells Final technical report [NASA-CR-73444]

p0059 N70-37465

CAPODICI, S.

A design for thick film microcircuit dc-to-dc converter electronics

p0173 A71-30801

CAPUTO, R. S.

Review of long life performance of lead telluride and silicon germanium RTG technologies

p0175 A71-38925

- CARESSA, J.-P.
Nonequilibrium ionization in magnetohydrodynamic conversion generators
p0186 A73-28071
- CAREY, J. E.
An analysis of the operation and stability of the constant-velocity MHD Hall generator.
p0138 A68-43068
- CARL, H.
Calculation and comparison of the economics of electrochemical fuel cells
p0185 A73-25346
Calculation and comparison of the economics of electrochemical fuel cells
[NASA-TT-F-15147]
p0254 A73-31991
- CARLSON, J. A.
Development of lightweight solar panels Summary report, Jan. 1966 - Mar. 1969
[NASA-CR-66832]
p0055 A69-38646
Development of lightweight aluminum hollowcore solar cell array technology
[NASA-CR-112002]
p0063 A72-13046
- CARPETIS, C.
The optimization of MHD induction converters.
p0150 A69-27504
Energy storage in superconducting coils
[DLR-FB-72-10]
p0267 A72-26656
General investigation and parametric study of inductive MHD converters including design and development of a cryogenically cooled experimental 4 kW converter
[DLR-FB-71-74]
p0251 A73-15757
- CARPETIS, G.
Some aspects on the optimization of an inductive MHD converter.
p0128 A68-23932
- CARROLL, S.
Lithium-nickel sulfide batteries
p0262 A71-13041
- CARROTHERS, R.
Economic generation of power from thermonuclear fusion
[CLM-R-85]
p0202 A68-25016
- CARSON, J. E.
Operation of a 20 Mw Hall generator.
p0127 A68-23919
- CARTER, C.
Optimization studies on open-cycle MHD generators.
p0133 A68-39724
- CASAGRANDE, E. D.
Design of a curium-244 heat source for the multi-hundred watt generator.
p0077 A73-38429
- CASAL, V.
Rod heaters with indirect resistance heating for simulation of nuclear fuel rods
[KFK-894]
p0230 A70-22247
- CASCI, C.
A method for preliminary analysis of MHD generator performance
p0252 A73-19051
- CASTEELS, F.
Simulations of the radioactive decay of Th-228/used in the form of ThO₂ as a heat source for thermionic energy conversion.
p0075 A72-36162
- CASTRO, E.
Advances in graded gap solar cell research.
p0040 A73-14207
- CATOE, C. E.
Results of overflights of Chevron oil spill in Gulf of Mexico Final report
[NASA-CR-117497]
p0095 A71-21304
The applicability of remote sensor techniques for oil slick detection
[AD-728422]
p0098 A72-14478
- CELINSKI, Z.
Optimum number of the load circuits in the Hall-type MHD-generator
p0170 A70-44990
Hall type MHD generators with nonuniform gas parameters along the channel axis
[INR-1107]
p0235 A70-33335
Electrical parameters in the Faraday type MHD generator with nonuniform gas properties in the magnetic field direction
[INR-1095]
p0235 A70-33547
- Electrical parameters in the Faraday-type MHD generator with nonuniform gas properties in the electric field direction
[INR-1096]
p0235 A70-33672
Numerical calculations of the electrical parameters in a Faraday-type MHD generator with two-dimensional gas flow
[INR-1199]
p0241 A71-27207
- CERINI, D. J.
Performance characteristics of a single-wavelength liquid-metal MHD induction generator with end-loss compensation.
p0122 A68-19849
A progress report on the JPL liquid-metal MHD cycle
p0167 A70-39986
Nak-nitrogen liquid metal MHD converter tests at 30 kW.
p0188 A73-38311
Liquid metal MHD power conversion
p0241 A71-22560
- CHABERT, J.
Continuous testing in the Marcoule plant
[ILL-RISLEY-TRANS-1866-/9091.9F]
p0091 A70-20596
- CHANDRELLAN, E. E.
Tankage systems for a methane-fueled supersonic transport
[NASA-TN-X-1591]
p0081 A68-23895
- CHANDRASEKHARA, B. C.
Effect of heterogeneity and Hall current on the MHD power generator.
p0182 A73-10434
- CHANG, P.
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
The performance of a family of diagonal conducting wall MHD open cycle generators
p0169 A70-40004
- CHANG, P.-C.
Energy sources in aircraft engines
[AD-685535]
p0116 A69-29919
The energy sources of aviation engines
[AD-707178]
p0016 A70-37672
- CHARGIN, A. K.
Large superconducting baseball magnet, part 1
[UCRL-71010]
p0218 A69-22640
- CHASE, J. O.
A field survey of emissions from aircraft turbine engines
[BM-R1-7634]
p0100 A72-25584
- CHASE, P. E.
Ecological effects of strip mining in Ohio
[E72-10069]
p0101 A72-31353
Determine utility of ERTS-1 to detect and monitor area strip mining and reclamation
[E72-10284]
p0103 A73-13334
Ecological effects of strip mining in Ohio
[E73-10003]
p0019 A73-15339
Ecological effects of strip mining in Ohio
[E73-10430]
p0106 A73-20391
Determine utility of ERTS-1 to detect and monitor area strip mining and reclamation
[E73-10641]
p0107 A73-25338
ERTS-1 investigation of ecological effects of strip mining in eastern Ohio
[PAPER-E2]
p0109 A73-28266
- CHAUVIN, J.
Aerodynamic problems in cooled turbine blading design for small gas turbine
p0220 A69-26532
- CHEBAN, A. G.
Solar elements based on heterojunctions of p-type GaAs/1-x/Fe/x/ and n-type GaAs
p0039 A72-30225
- CHEN, W.-I.
Influence of ultrasonic energy upon the rate of flow of liquids through porous media
p0092 A70-25326
- CHERNYKH, E. V.
Some results of an investigation of a single-component version of a liquid-metal MHD energy converter
p0148 A69-27488
- CHERNYSHEV, S. M.
Investigation of the influence of throttling on the efficiency of a Rankine cycle with an MHD generator
p0134 A68-41271

- CHEROW, J.**
Autonomous hydrogen/air fuel cell for long-life missions.
Fuel and hydrogen cells
p0184 A73-22752
p0116 A73-45025
- CHERRY, W. E.**
An assessment of solar energy as a national energy resource
[NASA-CN-133101]
p0068 N73-26818
- CHERRY, W. E.**
A concept for generating commercial electrical power from sunlight
p0034 A71-16100
The generation of pollution-free electrical power from solar energy.
[ASME PAPER 71-WA/SOL-2]
p0036 A72-15892
Some major terrestrial applications of solar energy.
p0045 A73-35312
The generation of pollution free electrical power from solar energy
[NASA-TN-X-65497]
p0061 N71-23700
- CHERTKOV, I. A. B.**
Effect of sulfides contained in fuels on their operational properties
p0072 A69-19456
- CHIMNOV, V. P.**
Electrophysical and radiative properties of a nonequilibrium argon-potassium plasma as a possible working fluid for an MHD generator
p0183 A69-23441
- CHITECHIAN, V. I.**
Methods of determining induced magnetic fields in linear DC MHD generators
p0143 A69-23454
- CHRISTEN, M.**
Diffusion of protons in solids - Applications to fuel cells
p0156 A69-32424
- CHRISTENSEN, L. D.**
Economic analysis of the use of gelled fuels in jet transport aircraft. Final report
[FAA-NA-70-45]
p0093 N70-34002
- CHRISTIANSEN, P.**
17alpha-H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734
- CHUNG, K.**
Plasma heating by the fast hydromagnetic wave.
p0122 A68-19482
- CIABRINI, J.**
Design considerations on 'advanced' rigid or semi-rigid solar panels.
p0038 A72-28034
- CIMA, R. M.**
Current distribution in conducting wall MHD generators
p0169 A70-40013
- CIVINSKAS, K. C.**
Preliminary appraisal of hydrogen and methane fuel in a Mach 2.7 supersonic transport
[NASA-TN-X-68222]
p0020 N73-22711
- CLARKE, D. R.**
Simulated space environment tests on cadmium sulfide solar cells
[NASA-CN-120840]
p0063 N72-14029
- CLARKE, L.**
New developments in degradation-resistant CdS solar cells
p0033 A70-43537
- CLEMENT, J. E.**
Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829
Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411
The Satellite Nuclear Power Station - An option for future power generation.
p0189 A73-38412
- CLEMENTS, P. E.**
Improved technology for multiwatt radioisotope heater units.
p0188 A73-36681
- CLEMENTS, T. R.**
Effect of fuel zoning and fuel nozzle design on pollution emissions at ground idle conditions for a double-annular ram-induction combustor
[NASA-CN-121094]
p0104 N73-17916
- CLEHOT, M.**
Summary of six years of converter tests in the laboratory
p0180 A72-36139
- CLEVELAND, J. E.**
Fluoride volatility Conference proceedings
[CONF-680610]
p0087 N69-37355
- CHOBLOCH, E.**
Construction and operation of a hydrazine-oxygen fuel cell module
p0170 A70-03541
- COCHE, J. C.**
Experimental results of MHD conversion using a rare gas
p0184 A69-23475
- COCKFIELD, R. D.**
Comparison of load bearing and non-load bearing radiators for nuclear Rankine systems
[NASA-CN-72307]
p0190 N68-10050
- COCKSHUTT, E. P.**
Gas turbine cycle calculations - The effects of fuel composition and heat of combustion
p0073 A70-43439
- COGHE, A.**
A method for preliminary analysis of MHD generator performance
p0252 N73-19051
- COHEN-SOLAL, G.**
Advances in graded gap solar cell research.
p0040 A73-14207
- COHEN, D. J.**
Initiation of spherical detonation in acetylene-oxygen mixtures
[BM-RI-7061]
p0116 N68-12434
- COHEN, E. D.**
Microwave power rectification with commercial Schottky barrier diodes
p0164 A70-21274
- COHEN, W. E.**
Hypersonic aircraft technology and applications
p0115 A70-31851
- COHENDY, G.**
The usefulness of the decay rate in the management of radioactive waste stocks
[CEA-R-3731]
p0087 N69-38022
- COHN, E. M.**
The fuel cell problem.
p0128 A68-24323
Research plans for solar power in space.
p0044 A73-29594
Electrochemical space power sources
[NASA-TN-X-60795]
p0263 N68-14818
Electrochemical space power sources
p0229 N70-16227
- COLACO, J. P.**
Large-scale concentration and conversion of solar energy.
p0039 A72-36075
- COLLADAY, R. S.**
Thermal feasibility of using methane or hydrogen fuel for direct cooling of a first-stage turbine-stator
[NASA-TN-D-6042]
p0117 N70-42326
- COLLIER, W.**
H2 fuel system investigation
p0017 N71-29607
- COLLINS, E. F.**
Open cycle fuel cell power plant direct currents, 1.5 KW
[AD-764285]
p0254 N73-30979
- COLLINS, R. J.**
An evaluation of the suitability of FRTS data for the purposes of petroleum exploration
[E73-11053]
p0112 N73-32229
- COLLINS, R. J., JR.**
An evaluation of the suitability of FRTS data for the purposes of petroleum exploration
[E72-10327]
p0103 N73-14315
An evaluation of the suitability of FRTS data for the purposes of petroleum exploration
[E73-10322]
p0105 N73-18354
An evaluation of the suitability of FRTS data for the purposes of petroleum exploration
[E73-10444]
p0106 N73-20404

- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[N73-10646] p0108 N73-25342
- COLLIS, W. J.
Effects of positive ion implantation into antireflection coating of silicon solar cells
[NASA-CR-131090] p0066 N73-19059
- CONROY, G. J.
Experimental investigations of an open-cycle, vortex MHD generator
[BN-RI-7699] p0251 N73-14746
- CONTZEN, J.-P.
Some remarks on EPD energy conversion p0216 N69-18446
Compilation of references on the direct conversion of heat into electrical energy
[BLG-427] p0223 N69-32934
- COOBS, J. H.
Coated-particle fuels
[ORNL-4324] p0083 N69-19605
- COOPER, R. F.
Power and energy for posterity. p0037 A72-18627
Power and energy for posterity p0019 N73-13864
- CORCORAN, C. S.
Development of a 1200-hertz alternator and controls for space power systems
[NASA-TN-X-52453] p0205 N68-31042
- COSTE, G.
Cadmium telluride photocells p0167 A70-38481
Technological improvements on CdS solar cells. p0038 A72-28016
- COSTE, G. B.
State of the CNES solar cell research and development programme. p0037 A72-28002
- COUFAL, O.
Optimization of superconducting magnetic MHD-generator systems p0185 A73-24594
- COULTAS, T. A.
Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion. p0190 A73-41676
- COUTURES, J. P.
Measurements of temperatures of products treated in a solar furnace by means of IR pyrometers p0032 A70-32424
- COX, F. W.
A field survey of emissions from aircraft turbine engines
[BN-RI-7634] p0100 N72-25584
- COX, R. E.
The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol. p0076 A73-25465
- COYNE, J. V., JR.
Parametric study of the performance characteristics and weight variations of large-area roll-up solar arrays
[NASA-CR-115821] p0060 N71-13427
- CRABTREE, W. L.
Power systems research at MSFC p0215 N69-18068
- CRAVEN, C. W., JR.
ROD : A nuclear and fuel cycle analysis code for circulating fuel reactors
[ORNL-TM-3359] p0098 N72-17737
- CRAWFORD, L.
Factors effecting the performance of diagonal conducting wall open cycle MHD generators
[AD-721455] p0242 N71-28718
- CRAWFORD, L. W.
The performance of a family of diagonal conducting wall MHD open cycle generators p0169 A70-49004
The performance of a family of diagonal conducting wall MHD open cycle generators
[AD-705159] p0235 N70-32986
- CRAWFORD, B.
Solar energy powered heliotrope
[NASA-CASE-GSC-10945-1] p0065 N72-31637
- CHESWICK, F. A.
A brief overview of the energy requirements of the Department of Defense
[AD-754824] p0106 N73-20819
- CHONIN, D. L.
2800 watt series inverter dc power supply. p0176 A72-11064
- CROSSLEY, P. A.
Review and evaluation of past solar cell development efforts Semiannual report, Jun. 1 - Nov. 30, 1967
[NASA-CR-92679] p0047 N68-16882
- CROWE, B. J.
Fuel cells: A survey
[NASA-SP-5115] p0253 N73-26045
- CRUE, C. E.
Enrichment of uranium by thermal diffusion
[NP-18173] p0093 N70-37298
- CSOERSZ, E.
On the fundamental phenomenon of magnetohydrodynamic energy conversion. p0157 A69-39165
- CUFF, K. F.
Thermoelectric-thermomagnetic energy converter staging. p0138 A68-42954
- CUNNINGHAM, G. W., III
ROD : A nuclear and fuel cycle analysis code for circulating fuel reactors
[ORNL-TM-3359] p0098 N72-17737
- CURREN, J. S.
Turbine performance in a gas-bearing Brayton cycle turboalternator
[NASA-TN-D-5604] p0227 N70-14220
- CURRIN, C. G.
Feasibility of low cost silicon solar cells. p0041 A73-14251
- CURTIN, D. J.
Foreign Solar Cell Symposium Summary report p0060 N71-17248

D

- DAGEJARTSSON, S.
Reliability of converter networks of thermionic power supply equipments p0177 A72-15696
Results of studies on thermionic reactor systems
[REPT-68-007] p0201 N68-21856
- DANILIAN, V. S.
Experimental investigation of an insector device
[NASA-CR-97878] p0209 N69-13286
- DANILOV, I. L.
Application of thermionic energy conversion in the USSR. p0156 A69-29279
- DASPET, E.
Isotopic energy sources p0226 N70-11304
Photovoltaic devices and systems p0056 N70-16228
- DASPET, E. H.
Space solar generator degradation and influence on their design p0055 N69-35592
- DAVENPORT, P. A.
Economic generation of power from thermonuclear fusion
[CLM-R-85] p0202 N68-25016
- DAVID, C.
Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-4243.P] p0085 N69-31119
- DAVID, J. P.
Action of radiation on the functioning of thermionic converters - Conversion of solar radiation p0026 A69-29261
- DAVID, K. H.
Calibration of solar cells
[ESRO-TN-79] p0058 N70-30210
Calibration of solar cells p0059 N70-30232
- DAVIS, B. K.
A dynamic solar-electric power/thermal control system for spacecraft. p0043 A73-22785

- DAWSON, P. G.
Results from USAEC plutonium utilization programs
conducted by Battelle-Northwest
[BNWL-SA-2065] p0082 N69-15237
- DAY, E. F.
The ion engine and large solar array for the X-5
spacecraft
[NAS-TR-68191] p0054 N69-24137
- DE BRUYNE, R. J. E.
Simulations of the radioactive decay of Th-228/
used in the form of ThO₂ as a heat source for
thermionic energy conversion. p0075 A72-36162
- DE GHOFF, H. M.
Combustion and propulsion
[AGARDOGRAPH-81] p0195 N68-17793
Thermodynamics of MHD energy conversion
p0197 N68-17810
- DE MARTINO, P. J.
Feasibility study 30 watts per pound roll-up solar
array Final report
[NASA-CR-96230] p0051 N68-32561
- DE MENTEN DE HORNE, T.
Fuels for supersonic aircraft p0094 N70-39640
- DEB, S.
Secondary ionisation and its possible bearing on
the performance of a solar cell. p0040 A73-12048
- DECAIRE, J. A.
Effects on electrode geometry similarity and
scaling laws in EPD energy conversion processes.
Part 1 - Fundamental considerations p0216 N69-18442
- DECHER, R.
MHD generator characteristics with insulator wall
losses p0164 A70-19321
- DEGROFF, H. M.
Thermodynamics of MHD energy conversion.
[AGARDOGRAPH 81] p0123 A68-22530
- DEIN, J.
The use of ERTS-1 MSS data for mapping strip mines
and acid mine drainage in Pennsylvania
[PAPER-23] p0110 N73-28267
- DEIN, J. L.
Acid mine drainage and strip mines
[E73-11112] p0112 N73-33269
- DEJONGHE, P.
Large scale production of Ac-227 and development
of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287] p0098 N72-16196
- DEL DUCA, M. G.
Thermodynamics and applications of
bioelectrochemical energy conversion systems.
[AGARDOGRAPH 81] p0125 A68-22545
Thermodynamics and applications of
bioelectrochemical energy conversion systems
p0199 N68-17826
- DEL TORO, V.
Electromechanical Devices for Energy Conversion
and Control Systems. p0131 A68-31864
- DELAFOUD, P.
Problems concerning automatic connection of an
aerogenerator to a network
[NASA-TT-F-14873] p0106 N73-21238
- DELAHOY, A. E.
Schottky barrier diodes for solar energy conversion.
p0042 A73-16816
- DELAQUAIRE, P.
One volt isotopic microgenerators
[CEA-R-3834] p0225 N69-40586
- DENETER, J. J.
Experimental investigations of an open-cycle,
vortex MHD generator
[BM-RI-7699] p0251 N73-14746
- DEMETRIADES, S. T.
Progress in analytical modeling of MHD power
generators.
[AD-741173] p0179 A72-29355
- DEMLDT, A. C.
Large scale production of Ac-227 and development
of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287] p0098 N72-16196
- DENZEL, D. L.
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
- MHD generator in two-terminal operation.
p0132 A68-39717
- DEONIGI, D. E.
Factors affecting the optimum fuel cycle
[BNWL-SA-3605] p0094 N71-21050
- DEREPOVSKII, N. T.
Energy characteristics of a coaxial plasma source.
p0115 A72-26754
- DESERNO, U.
A new stable high power giant-pulse laser at 0.53
mu using LiIO sub 3 p0163 A70-16470
- DESTEESE, J. G.
A radiantly heated radioisotope-powered thermionic
generator. p0128 A69-24403
Optimization of the quasi-vacuum mode thermionic
converter p0172 A71-25899
Detailed design of a 100-We multicell thermionic
power supply. p0180 A72-34583
- DETROYER, A.
Large scale production of Ac-227 and development
of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287] p0098 N72-16196
- DEVIN, B.
All-metal thermionic nuclear module
[CEA-COMF-1041] p0218 N69-24985
One volt isotopic microgenerators
[CEA-R-3834] p0225 N69-40586
- DEVOL, L.
Performance forecast of selected static energy
conversion devices
[AGARD-CP-21] p0203 N68-28714
- DEVOS, J. J.
Can thorium compete with uranium? An assessment
for heavy-water and graphite moderated reactors
[EUR-4264.E] p0085 N69-31081
- DEYO, J. W.
Experimental performance of a 2-15 kilowatt
Brayton power system in the Space Power Facility
using krypton
[NASA-TM-X-52750] p0229 N70-19190
- DIAMOND, S. D.
Secondary power conversion systems. p0129 A68-29145
- DICKINSON, R. J.
A turbine can power your pump. p0181 A72-36558
- DICKS, J. B.
A graphical presentation of magnetogasdynamic
accelerator and generator performance
characteristics. p0119 A68-12258
MHD generator in two-terminal operation.
p0132 A69-39717
The performance of a family of diagonal conducting
wall MHD open cycle generators p0169 A70-40004
The performance of a family of diagonal conducting
wall MHD open cycle generators p0235 A70-32986
- DICKS, J. B., III
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
- DICKS, J. B., JR.
Fluctuations in series connected open cycle MHD
generators
[AD-721454] p0242 N71-28680
Contributions from space technology to central
power generation p0250 N73-13865
- DIECKAMP, H. M.
Nuclear space power systems - Reactors, conversion
equipment, and power systems technology
p0192 N68-12191
Nuclear space power systems p0228 N70-16220
- DIETZ, H.
Development of batteries for automobiles with
electric propulsion p0265 N69-34699
- DIMITRIADES, B.
The association of automotive fuel composition
with exhaust reactivity
[BM-RI-7756] p0109 N73-27542

- DINI, D.**
Simple solutions of the helicopter propulsion system made possible using closed cycle for the working fluid
p0218 N69-23998
- DNITRIY, K. I.**
Investigation of a liquid-metal jet MHD generator
p0151 A69-27511
- DNITRIYEV, K. I.**
Investigation of a liquid-metal jet MHD generator
[NASA-CR-97864]
p0214 N69-13391
- DNITRIYEVSKIY, V. A.**
Thermodynamic efficiency of uranium-hexafluoride MHD-plants
[JPRS-55126]
p0247 N72-17956
- DODONOV, L. D.**
The effective electrical conductivity of a two-phase liquid-metal flow
[NASA-CR-97872]
p0209 N69-13240
- DOMOVAN, J. A.**
Fabrication and preliminary testing of a 3kw hydrogen resistor.
[AIAA PAPER 72-449]
p0115 A72-26186
Hydrogen resistors for primary propulsion of communications satellites.
p0009 A73-15741
- DOMOVAN, P.**
An assessment of solar energy as a national energy resource
[NASA-CR-133101]
p0068 N73-26818
- DOMOVAN, R. L.**
High-efficiency converter and battery charger for an RTG power source.
p0190 A73-42906
- DONSKOI, K. V.**
Selection of optimum conditions at the inlet of an MHD-generator channel
p0172 A71-22136
- DORSCH, R. G.**
Topics on Rankine cycle power systems technology
p0208 N69-12577
- DRABKIN, L. M.**
Calculation and cost optimization for some parameters of solar generator thermobatteries
p0036 A71-31671
Thermodynamic analysis and parameter optimization of a solar thermoelectric power plant with heat removal by radiation
p0039 A72-35509
Calculation and cost optimization of certain solar generator thermobattery parameters
[AD-759812]
p0068 N73-25104
- DRAGOS, L.**
Contribution to the study of end effects on the flow in MHD generators
p0120 A68-16360
Study of the end effects and the effect of the induced magnetic field in an MHD generator
p0126 A68-22803
Influence of the electrical conductivity tensor on the flow in a generator with finite electrodes
p0130 A68-29598
Magnetohydrodynamics
p0157 A69-41363
- DRAZDAUSKAS, C. J.**
Photovoltaic power systems on flight spacecraft Lunar Orbiter 3
[NASA-CR-100700]
p0054 N69-29374
- DREICER, H.**
Report of the Ad Hoc Panel on fusion research on low-beta plasmas confined in open-ended geometries
[TID-24254]
p0203 N68-29063
- DRIVEN, C.**
Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809]
p0009 A73-38373
- DROBYSHEV, L. V.**
Gasification of coal enrichment wastes
p0116 N70-10884
- DROISSART, A.**
Large scale production of Ac-227 and development of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287]
p0098 N72-16196
- DROWNIK, L. M.**
Investigation of a liquid-metal induction MHD generator
p0151 A69-27513
- DU PONT, P. S.**
Solar panel fabrication Patent
[NASA-CASE-TNP-03413]
p0062 N71-26726
- DUDEZINSKY, S. J.**
MHD induction generator.
p0138 A68-43067
- DUREEE, H.-J.**
Solar generators and solar cells
p0032 A70-29554
The Helios solar cell generator
[DGLR-PAPER-72-091]
p0066 N73-15084
- DURKHOVILINOV, S. D.**
Some results of an investigation of a single-component version of a liquid-metal MHD energy converter
p0148 A69-27488
- DURLEY, W. W.**
CO sub 2 laser-induced thermionic emission from metals - Direct energy conversion
p0162 A70-12068
- DUMAS, R. J.**
Power generating subcomponent/fuel cell module
[AD-744477]
p0249 N72-32078
- DUMONT, G.**
State of development of an actinium fueled thermionic generator.
p0075 A72-36169
- DUNARV, IO. A.**
Selection of optimum conditions at the inlet of an MHD-generator channel
p0172 A71-22136
- DUNLAY, J. B.**
SNAP-13 generator development program.
p0155 A69-29191
- DUNE, W. F.**
CdS solar cell development Final report
[NASA-CR-72534]
p0054 N69-23369
Improvements in CdS thin film solar cells Final technical report, 1 Nov. 1969 - 31 Oct. 1970
[AD-723315]
p0062 N71-31939
- DUNING, J. W., JR.**
Slag flow magnetohydrodynamic generator
[NASA-CASE-XLE-02083]
p0225 N69-39983
- DUPETIT, G. A.**
Determination of uranium with a potential-controlled coulometric titrator
[CHEA-192]
p0079 N68-17192
- DURAND, J. P.**
All-metal thermionic nuclear module
[CEA-CONF-1041]
p0218 N69-24985
- DVERNIKOV, V. S.**
Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- DVOROV, I. M.**
Deep-seated heat from the earth
[JPRS-59496]
p0109 N73-27324
- DWORSCHAK, J. R.**
MHD power generation using an RF-generated nonequilibrium plasma.
p0133 A68-41161
- DYER, H. K.**
Applicability of NASA contract quality management and failure mode effect analysis procedures to the USGS Outer Continental Shelf oil and gas lease management program
[NASA-TM-X-2567]
p0100 N72-25955
- DZHAUGASHVILI, K. E.**
Mercury flow with a hydraulic shock in a channel situated in a transverse magnetic field
p0149 A69-27499
- DZUNG, L. S.**
Laser-produced plasma and fusion yield.
p0181 A72-43723

E

- EASTLUND, B. J.**
The prospects of fusion power
p0171 A71-20000
The fusion torch - A new approach to pollution and energy usage
[CONF-691108-2]
p0015 N70-37081
- ECCLESTON, B. H.**
Influence of volatile fuel components on vehicle emissions
[BR-RI-7291]
p0117 N70-20511

- Comparative emissions from some leaded and prototype lead-free automobile fuels
[BMRI-7390] p0092 N70-28685
- The association of automotive fuel composition with exhaust reactivity
[BM-RI-7756] p0109 N73-27542
- BCCLESTON, D. B.**
Clean automotive fuel: Engine emissions using natural gas, hydrogen-enriched natural gas, and gas manufactured from coal (Synthane)
[TPR-98] p0099 N72-18761
- BECKERT, E. R. G.**
Goals and trends in heat transfer research.
p0178 A72-23684
- Solar power.
[AIAA PAPER 73-710] p0045 A73-36331
- EDGERTON, A. T.**
A study of passive microwave techniques applied to geologic problems
p0097 N72-12262
- Microwave radiometric detection of oil slicks
[AD-728551] p0098 N72-14402
- EDKIN, R. A.**
Experimental evaluation of a voltage regulator-exciter for a 15 kilovolt-ampere Brayton cycle alternator
[NASA-TN-D-4697] p0204 N68-29960
- EDOM, C.**
Cold hydrogen and basic electrolyte cells at the research center of the CGE
p0115 A69-21039
- EDWARDS, L.**
The performance of a family of diagonal conducting wall MHD open cycle generators
p0169 A70-40004
- EFREMOV, A. A.**
Thermoelectric generators
[AD-741858] p0248 N72-29045
- EGGERS, A. J., JR.**
Hypersonic aircraft technology and applications
p0115 A70-31851
- EGGERS, P. E.**
Performance of life tests and efficiency measurements for thermoelectric couples at constant thermal input power
[ASME PAPER 69-WA/ENER-14] p0163 A70-14896
- 'Unitized' thermoelectric module concept.
[ASME PAPER 71-WA/ENER-1] p0177 A72-15940
- Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources.
p0188 A73-38389
- ELLINGTON, G.**
Application of gas chromatography and mass spectrometry to porphyrin microanalysis - A study of homologous porphyrin series in ancient biological residues
p0073 A70-12516
- EINFELD, K.**
Development of advanced solar cell modulus technology for use by solar probes and large area solar cell arrays
[RF-93-0] p0048 N68-22010
- EISENBERG, J. D.**
Tankage systems for a methane-fueled supersonic transport
[NASA-TN-X-1591] p0081 N68-23095
- EITEL, H.**
Experimental work on inductive magnetoplasma dynamic converters.
p0146 A69-23490
- Magnetoplasma dynamic /MPD-/ converters
[DLR-FB-69-85] p0232 N70-26208
- ELBERG, R.**
Design considerations on 'advanced' rigid or semi-rigid solar panels.
p0038 A72-28034
- ELISEEV, V. B.**
Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity
p0185 A73-23473
- ELKIN, A. I.**
Selection of the flow regime in an MHD generator with series-connected electrodes
p0122 A68-19561
- ELLINGTON, H. I.**
The effect of the bulk gas on the electrical conductivity of potassium-seeded non-equilibrium plasmas.
p0123 A68-20829
- ELLIOTT, D. G.**
Performance characteristics of a single-wavelength liquid-metal MHD induction generator with end-loss compensation.
p0122 A68-19849
- Variable-velocity MHD induction generator with rotating-machine internal electrical efficiency.
[JPL-TR-32-1328] p0133 A68-39723
- Performance capabilities of liquid-metal MHD induction generators.
p0150 A69-27503
- Effect of slots on MHD induction generator efficiency
p0166 A70-30531
- Jet Propulsion Laboratory, Symposium on Engineering Aspects of Magnetohydrodynamics, 11th, California Institute of Technology, Pasadena, Calif., March 24-26, 1970, Proceedings
p0168 A70-40001
- Numerical analysis method for linear induction machines.
p0179 A72-29365
- Magnetohydrodynamic induction machine
[NASA-CASE-XNP-07481] p0218 N69-21929
- Two-fluid magnetohydrodynamic system and method for thermal-electric power conversion Patent
[NASA-CASE-XNP-00644] p0236 N70-36803
- ELLIOTT, J. J.**
Clean automotive fuel: Laboratory-scale operation of the synthane process
[TPR-49] p0099 N72-18760
- ELLIS, B.**
Calculated efficiencies of practical GaAs and Si solar cells including the effect of built-in electric fields
p0032 A70-21721
- ELLIS, W. H.**
Study of nuclear seeded MHD plasmas Yearly summary technical report no. 3, 1 May 1967 - 31 Nov. 1968
[AD-690542] p0225 N69-39863
- Nuclear generated plasmas
[AD-747681] p0250 N73-12800
- ELLSON, R. A.**
Design and preliminary operation of the Lewis magnetohydrodynamic generator facility
[NASA-TN-D-4867] p0207 N68-37259
- EMERSON, D.**
Results of studies on thermionic reactor systems
[REPT.-68-007] p0201 N68-21856
- EMERY, K. O.**
Eastern Atlantic Continental Margin program of the international decade of ocean exploration (GX-28193), some results of 1972 cruise of R/V Atlantis 2
[PB-211393] p0103 N73-14400
- ENGDAHL, R.**
Hydrogen generator assemblies
[AD-733931] p0118 N72-14520
- ENGLISH, R. E.**
Technology for nuclear dynamic space power systems
p0166 A70-29492
- ERB, D. E.**
A brief overview of the energy requirements of the Department of Defense
[AD-754824] p0106 N73-20819
- ERMILOV, A. N.**
Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity
p0185 A73-23473
- ERTZ, A.**
A cylindrical coaxial MHD generator
p0165 A70-24855
- ESGAR, J. B.**
Cryogenic fuels for aircraft
p0118 N71-19463
- ESPI, J.**
A fuel conservation study for transport aircraft utilizing advanced technology and hydrogen fuel
[NASA-CR-112204] p0102 N73-11019
- EULER, K. J.**
Direct Energy Conversion
p0121 A68-17791

- Technical problems of direct energy conversion
p0121 A68-17792
- Energy-direct conversion today. II
p0181 A72-39940
- EUSTIS, R. E.**
Effects of electrode and boundary-layer
temperatures on MHD generator performance.
p0126 A68-23911
- Effects of electrode and boundary-layer
temperatures on MHD-generator performance.
p0132 A68-39715
- Electrode size effects in combustion-driven MHD
generators
p0169 A70-40005
- Current distribution in conducting wall MHD
generators
p0169 A70-40013
- Effects of electrode size on the performance of a
combustion-driven MHD generator
p0173 A71-29880
- Boundary phenomena in MHD generators Summary
report, 15 Feb. 1966 - 15 Feb. 1968
[AFOSR-68-0859]
p0202 N68-26537
- Electrode temperature effect on MHD generator
performance
[AD-683793]
p0220 N69-27071
- EVANS, G. E.**
Hydrazine-air fuel cells.
p0119 A68-13240
- Hydrazine-air fuel cell controls
[AD-684339]
p0221 N69-28781
- EVANS, R. A.**
Preionization in nonequilibrium plasmas
p0168 A70-39991
- EVERETT, B. J.**
The aerial detection of Co-60 fueled radioisotope
thermoelectric generators
[SC-TM-68-627]
p0013 N69-19492
- EYRAUD, C.**
Direct electrochemical conversion of the energy of
a radioactive element
p0142 A69-21054
- F**
- FABRI, J.**
Combustion and propulsion
[AGARDOGRAPH-81]
p0195 N68-17793
- FAIRBANKS, J. W.**
Terrestrial adaptation of the thermal heliotope.
[ASME PAPER 71-WA/SOL-10]
p0037 A72-15893
- Passive solar array orientation devices for
terrestrial application.
p0043 A73-22440
- FAITH, L. E.**
Hydrocarbon fuels for advanced systems
[AD-737372]
p0100 N72-23806
- FAITH, T.**
Study to determine and improve design for
lithium-doped solar cells Quarterly report, 1
Oct. - 31 Dec. 1970
[NASA-CR-116220]
p0060 N71-16472
- FALECKI, J.**
Wankel engines for aircraft
[BEPT-908]
p0247 N72-26764
- FANGER, J. B.**
Electrical component technology for 1/4 to 10
megawatt space power
[CONF-680802-1]
p0206 N68-34481
- FARBER, E. A.**
Solar energy, its conversion and utilization
p0066 N73-13866
- FARKAS, B. S.**
A brief overview of the energy requirements of the
Department of Defense
[AD-754924]
p0106 N73-20819
- FAUGERAS, P.**
Treatment of fuel by the dry method. Studies
performed in France
[CFA-CONF-1195]
p0083 N69-25510
- Nonaqueous fuel processing - Research conducted in
France
[AFL-TRANS-784]
p0084 N69-25563
- Reprocessing of irradiated plutonium and uranium
mixed oxides
[CFA-CONF-1534]
p0093 N70-39139
- FAY, J. A.**
The spread of oil slicks on a calm sea
p0257 N70-16537
- FEDORUS, G. A.**
Heterogeneous solar cells based on polycrystalline
cadmium sulfide and selenide
p0033 A70-36238
- Longwave sensitivity of nCdS-pCu/2-x/S solar
converters
p0034 A71-11896
- Efficiency of solar energy converters based on
CdS-Cu/2 minus x/S heterojunctions
p0036 A71-42536
- Some properties of photoconverters based on
compressed sintered tablets /CST/ of CdS
p0036 A71-44390
- Heterogeneous solar converters based on
polycrystalline cadmium sulfide and gadmium
selenide
[AD-756594]
p0067 N73-21960
- FEDOSOV, B. I.**
Superconductors in marine technology
[AD-755711]
p0252 N73-22702
- FEDYNSKIY, V. V.**
Exploratory geophysics in the USSR during the
years of Soviet Rule /1917-1967/
p0079 N68-17606
- FEBRENBACHER, L. L.**
Electrode and insulation materials in
magnetohydrodynamic generators.
[AD-737019]
p0178 A72-22401
- FELBER, F. P., JR.**
Research on the properties of binary liquid metal
systems with lithium as one component - The
electrical resistivity of liquid lithium
saturated with cesium Final report
[NASA-CR-110370]
p0233 N70-29729
- FELDMANN, H. F.**
The effect of air/fuel level in the MHD generator
on the operation of an open-cycle MHD-topped
power plant
p0166 A70-30534
- FELLS, I.**
Non-equilibrium modes of MHD converters.
[AGARDOGRAPH 81]
p0123 A68-22531
- Experimental and theoretical studies of gaseous
suspensions of thermionic emitting particles for
use as MHD working fluids.
p0146 A69-23491
- Non-equilibrium modes of MHD-converters
p0197 N68-17811
- FENG, S. Y. H.**
Regulated dc to dc converter for voltage step-up
or step-down with input-output isolation
[NASA-CASE-HQN-10792-1]
p0248 N72-27230
- FENN, D. B.**
Performance of the electrically-heated 2 to 15 kWe
Brayton power system
p0173 A71-32212
- Experimental performance of a 2-15 kilowatt
Brayton power system in the Space Power Facility
using krypton
[NASA-TN-X-52750]
p0229 N70-19190
- FERGUSON, R. C.**
Feasibility study 30 watts per pound roll-up solar
array Final report
[NASA-CR-96230]
p0051 N68-32561
- FERNANDEZ, T.**
Heat transfer from radioisotopic power sources in
porous media
[AD-691213]
p0225 N69-40031
- FERNANDOPULLE, D.**
Geological analysis of aerial thermography of the
Canary Islands, Spain.
p0077 A73-39896
- FERRARI, G.**
Employment of LPG as fuel in a fuel cell
p0073 A70-36657
- FERRIER, M.**
Energy storage in a superconducting winding
[LA-TR-70-9]
p0265 N71-11913
- FERRRO, V.**
Thermodynamics of thermoelectric conversion.
[AGARDOGRAPH 81]
p0125 A68-22539
- Thermodynamics of thermoelectric conversion
p0198 N68-17819
- FETTERMAN, D. E.**
Potential of hydrogen fuel for future air
transportation systems.
[ASME PAPER 73-ICT-104]
p0010 A73-43499

- FIALKO, A. I.**
Filtration of heat carriers in earth core rocks at a depth of from 6 to 8 kilometers
p0090 N70-16589
Pressure effects on filtration of a heat carrier in earth core rocks
p0090 N70-16589
- PICKETT, A. P.**
Electrolytic hydrogen fuel production with solid polymer electrolyte technology.
p0116 A73-38413
- FISCHELL, E. E.**
Solar cell power systems on US satellites. Part 2 - Satellites designed by the JHU, Applied Physics Laboratory
p0056 N7C-12695
- FISCHER, F. W.**
Experimental investigation of the current density distribution in a simulated MHD generator.
p0129 A68-27085
- FISCHER, H.**
Silicon solar cell technology of the seventies
p0034 A71-16103
Telesun, the solar cell of the future
p0037 A72-17751
Some innovations in silicon solar cell technology.
p0038 A72-28029
Contribution to silicon solar cell technology.
p0039 A72-37780
- FISCHER, H.**
High temperature fuel cell system for the conversion of methane.
p0182 A73-15118
- FISHER, W., JR.**
Detection, delineation, and monitoring of subsurface coal fires by aerial infrared scanning
p0086 N69-33683
- FISHMAN, F. J.**
Instability of Hall MHD generators to magneto-acoustic waves
[RR-323]
p0217 N69-21275
- FLAHERTY, B.**
Thermally cascaded thermoelectric generator
[NASA-CASE-NPO-10753]
p0247 N72-26031
- FLEMING, E. D.**
Clean automotive fuel: Engine emissions using natural gas, hydrogen-enriched natural gas, and gas manufactured from coal (Synthane)
[TPB-48]
p0099 N72-18761
Emission characteristics of propane as automotive fuel
[DM-RI-7672]
p0101 N72-31768
- FLORET, F.**
Action of radiation on the functioning of thermionic converters - Conversion of solar radiation
p0026 A69-29261
- FOERSTER, S.**
Applied magnetohydrodynamics, no. 3
[JUL-510-TP]
p0201 N68-21331
- FOEL, M.**
Measurements of temperatures of products treated in a solar furnace by means of IR pyrometers
p0032 A7C-32424
Remarks concerning solar furnaces in space.
p0039 A72-37675
- FORRESTIERI, A. P.**
Status of the cadmium sulfide thin-film solar cell.
p0025 A68-42518
Thermal cycling test of a flexible solar cell module
[NASA-TM-X-52995]
p0061 N71-21206
- FORGHAM, S. L.**
Fuel related problems in aircraft fuel systems
p0097 N72-11677
- FORNICA, R.**
Solar array simulator
p0064 N72-31077
- FORNEY, A. J.**
Clean automotive fuel: Laboratory-scale operation of the synthane process
[TPB-49]
p0099 N72-19760
The remote sensing of air pollution from coal utilization
p0101 N72-29363
- FORTINI, A.**
Development of a thermophotovoltaic converter
[AGARDOGRAPH 81]
p0125 A68-22508
Effect of a thermophotovoltaic converter
p0199 N68-17829
- POSTER, H. J.**
Development of a single-grade general aviation avgas
[SAE PAPER 710369]
p0073 A71-24239
- POWLER, T. K.**
Report of the Ad Hoc Panel on fusion research on low-beta plasmas confined in open-ended geometries
[TID-24254]
p0203 N68-29663
- POX, F.**
Deep sea radioisotope-fueled thermoelectric generator power supply system. SNAP-21 program, phase 2 - 10-watt system Final summary report
[NMM-3691-62]
p0239 N71-15039
- POX, F. K.**
SNAP-21 program. Phase 2 - Deep sea radioisotope-fueled thermoelectric generator power supply system Quarterly report, Apr. 1 - Jun. 31, 1967
[NMM-3691-25]
p0191 N69-11382
- FRAAS, A. P.**
Engineering problems in the design of controlled thermonuclear reactors.
[AIAA PAPER 73-259]
p0182 A73-16990
Heat transfer limitations for dynamic converters
p0195 N68-17797
Diffusion process for removing tritium from the blanket of a thermonuclear reactor
[ORNL-TM-2358]
p0083 N69-19229
Preliminary appraisal of the hazards problems of a D-T fusion reactor power plant
[ORNL-TM-2822]
p0015 N70-37097
- FRADIN, J.**
Design of a pilot cell for strontium-90 extraction by solvent
[EUR-3613.F]
p0078 N68-10864
- FRADIN, G. E.**
Isotopic electric power sources for radiometeorological stations
p0201 N68-21974
- FRAZER, W. E.**
A survey of propulsion systems for low emission urban vehicles
[PB-200144]
p0097 N72-10830
US transportation: Some energy and environmental considerations
[PB-213034]
p0020 N73-20991
- FRANCE, D. E.**
The contribution of space-charge in slender channel electroquasidynamics
p0165 A70-25936
EGD energy converter geometry studies
p0167 A70-30536
One-dimensional particulate electroquasidynamics
p0170 A70-40257
- FRANKENTHAL, S.**
Performance of thermochemically driven MHD converters.
p0130 A68-29901
- FRANTSEVICH, I. N.**
Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- FREEDMAN, S. I.**
The impact of aerospace technology on energy conversion in the 70's.
[ASME PAPER 72-AERO-11]
p0208 A72-43147
- FREIS, R. P.**
Experimental and computational investigations of the direct conversion of plasma energy to electricity
[CONF-710607-126]
p0244 N71-38863
- FREHY, J.**
Technological improvements on CdS solar cells.
p0038 A72-28016
- FRIEDL, E. T.**
Arctic resources airplane transportation system.
p0077 A73-41172
- FRIEDMAN, YU. I.**
Certain design peculiarities of automotive gas turbines
[AD-694842]
p0227 N70-14488
- FROLOV, A. D.**
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models
p0144 A69-24463
- FRYSINGER, G. R.**
Fuel cell - Battery power sources for electric cars
[AD-662235]
p0193 N69-15525

- Fuel cell-energy storage hybrid systems for vehicles
[AD-662236] p0193 N68-15641
- Battery-fuel cell system
[AD-662234] p0194 N68-15712
- Power sources for electric cars
[ECOH-2929] p0202 N68-23140
- Fast transient response fuel cell-battery hybrid
power source
[AD-692538] p0226 N70-10447
- Power sources for long economic life
communications equipment
[AD-693847] p0227 N70-13293
- FUSCOE, J. E.
Thermodynamics and applications of
bioelectrochemical energy conversion systems.
[AGARDOGRAPH 81] p0125 A68-22545
- Thermodynamics and applications of
bioelectrochemical energy conversion systems
p0199 N68-17826

G

- GAERTNER, H. R. V.
Advances in organic geochemistry 1971; Proceedings
of the Fifth International Meeting, Hanover,
West Germany, September 7-10, 1971. p0076 A73-25459
- GAIBNAZAROV, E.
Power characteristics of a solar thermoelectric
generator. p0030 A70-10752
- Cascaded thermoelements and methods of their design.
p0162 A70-10754
- Feasible energy and technical characteristics of
solar thermoelectric generator /STEG/ with
two-stage converter p0032 A70-32425
- GAINES, L.
Lithium-nickel sulfide batteries p0262 A71-13041
- GALE, R.
New developments in degradation-resistant CdS
solar cells p0033 A70-43537
- GAMMEL, G.
State of development of an actinium fueled
thermionic generator. p0075 A72-36169
- GANEFELD, R. V.
Plasma stability and voltage fluctuations in an
MHD-generator p0121 A68-18285
- GANGADHAN, R. B.
Investigation on silicon p-n junction for solar
energy conversion. p0024 A68-31623
- GANN, A.
Some aspects on the optimization of an inductive
MHD converter. p0128 A68-23932
- The optimization of MHD induction converters.
p0150 A69-27504
- Theoretical analysis of an inductive, cylindrical
MHD converter with cryogenically cooled windings
[DLR-FB-70-25] p0240 N71-17840
- General investigation and parametric study of
inductive MHD converters including design and
development of a cryogenically cooled
experimental 4 kW converter
[DLR-FB-71-74] p0251 N73-15757
- GARATE, J. A.
Design of a curium-244 heat source for the
multi-hundred watt generator. p0077 A73-38429
- GARF, B. A.
Applications of selective coatings in solar
thermoelectric generators. p0031 A70-10767
- GARRIBBA, S.
Heat transfer from radioisotopic power sources in
porous media
[AD-691213] p0225 N69-40031
- GASPAROTTO, M.
Closed cycle M.H.D. experiments with a large
blow-down facility. p0127 A68-23929
- GASPER, R. A.
Development of a plutonium-fueled miniature power
supply based on thermionic conversion. p0186 A73-26028
- GAVRILOVA, M. D.
The effective electrical conductivity of a
two-phase liquid-metal flow
[NASA-CR-97872] p0209 N69-13240
- GAY, E. C.
Development of high-specific-energy batteries for
electric vehicles
[ANL-7953] p0267 N73-19061
- GAY, P.
Closed cycle M.H.D. experiments with a large
blow-down facility. p0127 A68-23929
- GATTE, B.
Summary of six years of converter tests in the
laboratory p0180 A72-36139
- GEARHART, M.
Gamma-ray logging in uranium prospecting
[SM-112/15] p0084 N69-30790
- GERETH, R.
Silicon solar cell technology of the seventies
p0034 A71-16103
- Telesun, the solar cell of the future p0037 A72-17751
- Some innovations in silicon solar cell technology.
p0038 A72-28029
- Contribution to silicon solar cell technology.
p0039 A72-37780
- GERMAN, V. O.
Experimental investigation of the performance of a
porous electrode in an MHD converter during the
injection of argon with potassium addition
p0190 A73-39619
- GERMANIUK, V. E.
Investigation of an MHD-generator model with an
argon-potassium plasma p0141 A69-17909
- Experimental study of an MHD generator model with
a nonequilibrium plasma p0145 A69-23480
- GERMANIUK, V. E.
Study of a model of an MHD generator using an
argon potassium plasma
[AD-728591] p0246 N72-13698
- GERTIS, K.
Problems of room heating in summer p0059 N70-30560
- GERWIN, H. J.
Selected thermoelectric, thermionic, and
electron-voltaic energy conversion device
characteristics
[SC-ARPIC-1011] p0224 N69-38033
- GHEZZI, U.
A method for preliminary analysis of MHD generator
performance p0252 N73-19451
- GIEZEN, A. J.
100 kWe thermionic power system design. p0186 A73-26026
- GILBERT, R. E.
Flywheel feasibility study and demonstration
[PB-200143] p0266 N72-11410
- GILL, D. E.
Lasers for fusion. p0187 A73-35379
- GILLIGAN, J. E.
Thermal control materials and technology in the
1970's.
[ASME PAPER 73-ENAS-7] p0045 A73-37969
- GINSBURG, V. B.
Problems of increasing the reliability of
automatic mining equipment
[NASA-TN-X-61123] p0081 N68-25716
- GIVENS, W. W.
Advances in nuclear geophysical methods in oil
geology and rock analysis
[SM-112/25] p0085 N69-30800
- GLASER, P. E.
Power from the sun - Its future. p0026 A69-12296
- Power without pollution p0035 A71-28665
- Concept for a satellite solar power system.
p0036 A72-11770

- Power without pollution. p0037 A72-18625
- The feasibility of a satellite solar power station. p0042 A73-15801
[ASME PAPER 72-WA/SOL-61]
- Space resources to benefit the earth. p0042 A73-18027
- Satellite solar power station - An option for power generation. p0043 A73-22791
- The potential of power from space. p0044 A73-24554
- The feasibility of a satellite solar power station. p0045 A73-32718
- Solar power via satellite. p0045 A73-35313
- Solar power via satellite. p0046 A73-39247
- Power without pollution p0019 N73-13870
- GLASSMAN, A. J.**
Brayton cycle systems p0208 N69-12578
- GLUKHIKH, V. A.**
Experimental investigation of liquid-metal MHD generators p0151 A69-27512
- GLUYAS, R. E.**
Nuclear reactor heat sources for future power generation p0012 N69-12576
- GHAN, L. E.**
Solar thermoelectric generator design and panel development program [NASA-CR-72340] p0046 N68-12252
- GODFREY, T. G.**
Coated-particle fuels [ORNL-4324] p0083 N69-19605
- GOERGENS, E.**
The Helios solar cell generator [DGLR-PAPER-72-0911] p0066 N73-15084
- GOLAEV, E.**
Calculation procedures and energetic characteristics for cooling systems with an atomizing-nozzle chamber and solar heaters p0037 A72-24314
- GOLD, D. P.**
The use of ERTS-1 MSS data for mapping strip mines and acid mine drainage in Pennsylvania [PAPER-E3] p0110 N73-28267
- GOLDSMITH, J. V.**
Large area silicon solar array development. p0044 A73-29593
- GOLDSMITH, P.**
Study to establish criteria for a solar cell array for use as a primary power source for a lunar-based water electrolysis system, phase 4 [NASA-CR-119945] p0062 N71-36441
- GOLOVNER, T. M.**
Optical characteristics of silicon photocells and the efficiency of a thermal photoelectric converter p0023 A68-18449
- Optical characteristics of silicon photocells and the efficiency of a thermophotovoltaic converter. p0025 A68-39356
- GOLUBEV, V. S.**
Pulsed model of a magnetohydrodynamic generator having a strongly nonequilibrium plasma p0174 A71-35273
- GONCHARENKO, D. K.**
Energy characteristics of a coaxial plasma source. p0115 A72-26754
- GONCHARENKO, V. P.**
Energy characteristics of a coaxial plasma source. p0115 A72-26754
- GONIK, A. A.**
Some characteristics of the protective effect of petroleum-soluble corrosion inhibitors for iron in the electrolyte-hydrocarbon two-phase system [AD-694781] p0258 N70-14391
- GOODLELL, G.**
Design and fabrication of wraparound contact silicon solar cells [NASA-CR-121003] p0767 N73-20044
- GOODHUE, W. E.**
Power systems research at MSFC p0215 N69-18068
- GOODMAN, B. B.**
Applications of superconductivity. p0187 A73-34111
- GOPIN, A. J.**
Solar absorbance of a cylindrical solar cell array. [AIAA PAPER 72-571] p0037 A72-16909
- GORANSON, R. B.**
Improved technology for multiwatt radioisotope heater units. p0168 A73-36681
- GORBENKO, V. S.**
Filtration of heat carriers in earth core rocks at a depth of from 6 to 8 kilometers p0090 N70-16589
- GORCHAK, L. V.**
Solar elements based on heterojunctions of p-type GaAs/1-x/P/x/ and n-type GaAs p0039 A72-30225
- GORSKI, L.**
On the feasibility of the determination of water, salt and sulphur in crude oil by means of neutron activation analysis p0089 N70-15280
- GOTTLIEB, J. J.**
Present status of electric automobiles p0266 N71-22199
- GOUBAU, G.**
Microwave power transmission from an orbiting solar power station p0035 A71-28666
- GOUGH, W. C.**
The prospects of fusion power p0171 A71-26700
- The fusion torch - A new approach to energy usage [CONF-691108-2] p0015 N70-37081
- GOVER, A.**
Vertical multi-junction solar cell. p0041 A73-14213
- GRAP, J. C.**
Radioisotopes- Famine of feast - A review of availability p0074 A71-38948
- GRAFF, C. B.**
Power systems research at MSFC p0215 N69-18068
- GRAHAM, J. W.**
Isotope reentry vehicle design study preliminary design - Phase 2 Final report [NASA-CR-72555] p0223 N69-34989
- GRAHAM, L. E.**
The effect of advanced propulsion on future rotary wing type aircraft p0218 N69-23996
- GRAHAM, R. W.**
Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications. [ASME PAPER 72-APRO-12] p0181 A72-43148
- GRANT, S. C.**
Thirty-five millimeter color oblique aerial photography as a tool for reconnaissance exploration for uranium mineralization in the Tertiary basins of Wyoming p0100 N72-26334
- GRAWATSCHE, E.**
Applied magnetohydrodynamics, no. 3 [JUL-510-TP] p0201 N68-21711
- Applied magnetohydrodynamics. Number 5 - MHD-nuclear power stations [JUL-689-TP] p0242 N71-30458
- Applied magnetohydrodynamics, report no. 10, MHD-test facility Argas 2: Description and operations [NASA-TT-F-14876] p0252 N73-22662
- GRAZIANI, G.**
Can thorium compete with uranium? An assessment for heavy-water and graphite moderated reactors [EUR-4264.E] p0085 N69-31091
- GRECHUSHKINA, N. E.**
Growth of microorganisms in media with petroleum fuels [AD-680804] p0083 N69-20205
- GREEN, I. D.**
Lifetime consideration and economic evaluation of a large, fast, breeder, mixed fuel cycle system p0230 N70-22218

PERSONAL AUTHOR INDEX

GUTMAN, I. I.

- GREEN, J. B.
CdS solar cell development Final report
[NASA-CR-72534] p0054 N69-23369
- GREEN, J. B.
Lithium-doped silicon solar cells state-of-the-art
[AD-764357] p0068 N73-30982
- GREENWOOD, C. D.
Five hundred-watt indirect hydrocarbon-air fuel
cell systems Midterm report, 10 Apr. - 9 Sep.
1967
[PWA-3211] pC200 N68-20884
- GREGORY, D. P.
Fuel cells.
p0178 A72-24700
- GREIBER, A.
Autonomous hydrogen/air fuel cell for long-life
missions.
p0184 A73-22752
- Fuel and hydrogen cells
p0116 A73-45025
- GRILLIKES, V. A.
Analysis of radiant transfer processes in
cylindrical cavity-type receivers of solar
installations
p0027 A69-32799
- A universal power characteristic of a
high-temperature solar heat source
p0039 A72-35516
- Methods for the quality control of the reflecting
surfaces of solar energy condensers /Survey/
p0040 A72-43187
- Analysis of the parameters of solar-heat power
sources with energy storage units
p0045 A73-34283
- GROBMAN, J.
Turbojet emissions - Hydrogen versus JP.
p0116 A73-37498
- GROCE, I. J.
Development of a thermally regenerative
sodium-mercury galvanic system. II - Design,
construction, and testing of a thermally
regenerative sodium-mercury galvanic system.
p0129 A68-27639
- GRODKO, V. A.
Thermodynamics of systems directly converting
chemical energy into electric energy
p0180 A72-32994
- On the thermodynamics of systems of direct
conversion of thermal into electrical energy
p0239 A71-13249
- GROLL, M.
Results of studies on thermionic reactor systems
[REPT.-68-007] p0201 N68-21856
- GROSMAN, E. B.
Practical application of underground heat sources
p0089 N70-16585
- GROW, B. W.
Investigation of synchronous-wave RF to dc
conversion Final report, 1 Jun. 1966 - 31 Dec.
1967
[REPT.-4] p0205 N68-30681
- GROEMM, R.
Supplementary material to the report nuclear fuel
requirements and costs of various reactor types
in Germany, KFK 366
[KFK-466] p0081 N68-22608
- GROND, J. E.
Subassembly test program outline for FY 1969 and
1970
[IN-1313] p0088 N70-13396
- GRIC, G.
Identification of geostructures of continental
crust particularly as they relate to mineral
resource evaluation
[E73-10321] p0105 N73-18353
- Identification of Geostructures of continental
crust, particularly as they relate to
mineral-resource evaluation
[E73-11035] p0112 N73-31339
- GUAZZONI, G. E.
Characterizing thermoelectric generators.
p0180 A72-31375
- GUBAREV, A. V.
Effect of certain factors on the external
characteristics and efficiency of MHD generators
p0167 A70-39636
- Certain problems of the efficiency of power
production in MHD generators with a
nonequilibrium plasma
[IAE-1701] p0235 N70-33216
- Limit characteristics of an MHD generator with a
nonequilibrium plasma
[AD-726588] p0244 N71-37309
- Some questions of the effectiveness of the
production of electroenergy in MHD-generator in
a nonequilibrium plasma
[AD-724973] p0245 N72-10782
- GUDERJANN, C. A.
Non-equilibrium ionization in a potassium gas MHD
device Final report
[AI-67-138] p0192 N68-11928
- GUDKOV, L. V.
Energy economics prognostication for the prospects
of solar radiation utilization
p0037 A72-24316
- GURNARD, P.
High power linear beam tube devices
p0035 A71-28669
- GUNTERT, D. C.
Brayton cycle systems
p0208 N69-12578
- GUEST, G. E.
Report of the Ad Hoc Panel on fusion research on
low-beta plasmas confined in open-ended geometries
[TID-24254] p0203 N68-29063
- GUETTLER, G.
Impurity photovoltaic effect in silicon.
p0027 A69-35679
- GUBA, S.
Effective conductivity in a segmented- electrode
magnetohydrodynamic generator with elevated
electron temperature.
p0120 A68-15642
- GUINARD, M. W.
The remote sensing of oil slicks by radar
[AD-709982] p0258 N70-42226
- Radar monitoring of oil pollution
p0097 N72-12311
- GUINN, V. P.
Neutron activation analysis identification of the
source of oil pollution of waterways
p0088 N70-15236
- Development of nuclear analytical techniques for
oil slick identification, phase I
[GA-9889] p0094 N71-15083
- GUIST, L. R.
Solid medium thermal engine
[NASA-CRSE-ARC-10461-1] p0252 N73-20931
- GUN, J. D.
Solar arrays utilizing large area silicon solar
cells.
p0028 A69-35708
- GUPTA, D.
Supplementary material to the report nuclear fuel
requirements and costs of various reactor types
in Germany, KFK 366
[KFK-466] p0081 N68-22608
- GURASHVILI, V. A.
Effect of certain factors on the external
characteristics and efficiency of MHD generators
p0167 A70-39636
- Parameters of magnetohydrodynamic /MHD/-generators
taking into account ionization instability of
plasma
[FTD-MT-24-205-67] p0206 N68-35442
- Certain problems of the efficiency of power
production in MHD generators with a
nonequilibrium plasma
[IAE-1701] p0235 N70-33216
- Some questions of the effectiveness of the
production of electroenergy in MHD-generator in
a nonequilibrium plasma
[AD-724973] p0245 N72-10782
- GUS'KOV, I. O. K.
Physical bases of thermionic energy conversion
p0190 A73-41876
- GUSEV, N. A.
Thermal activity of the Uson Caldera based on
infrared and photographic aerial survey.
p0077 A73-39895
- GUTMAN, I. I.
Thermodynamic efficiency of uranium-hexafluoride
MHD-plants
[JPRS-55126] p0247 N72-17956

GUTSTEIN, M. U.
Status of advanced Rankine power conversion technology
[GESP-623] p0174 A71-33525
Some contributions to energetics by the Lewis Research Center and a review of their potential non-aerospace applications.
[ASME PAPER 72-ABRO-12] p0181 A72-43148

Topics on Rankine cycle power systems technology
p0208 N69-12577

GYUREK, J. W.
Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems. Power conditioning - Parametric screening study
[WAED-67-45E] p0206 N68-32748

H

HAAS, G. E.
Large-scale concentration and conversion of solar energy.
p0039 A72-36075

HAAS, R. J.
High energy density silver-hydrogen cells for space and terrestrial applications.
p0188 A73-38403

HACKLEMAN, R. P.
Development of nuclear analytical techniques for oil slick identification, phase 1
[GA-9889] p0094 N71-15083

HAFELKE, W.
Supplementary material to the report nuclear fuel requirements and costs of various reactor types in Germany, KFK 366
[KFK-466] p0081 N68-22608

HARN, G.
Investigation of argon discharges with metal capillary cathodes.
p0143 A69-23450

HAINES, M. G.
The effect of local non-equilibrium ionization in a segmented electrode MHD generator.
p0133 A68-00538

Closed-cycle MPD experiments with applied electric and magnetic fields.
p0145 A69-23479

HALEY, V. F.
HMW converter design and performance summary.
p0189 A73-38419

HALL, C. A. S.
Ecological effects of energy: A basis for policy in regional planning
[BNL-16228] p0018 N72-20371

HALLETT, M. C.
Future cost of liquid hydrogen for use as an aircraft fuel.
p0001 A68-33457

Study, cost, and system analysis of liquid hydrogen production Final report
[NASA-CR-73226] p0011 N68-28227

HAMILTON, R. C.
One watt 30-day plus power sources
[AD-675936] p0264 N69-11907

Performance, analysis selection of balloon electrical power systems
[AD-682898] p0219 N69-25803

HANNITT, A. G.
Chemical energy engines.
p0123 A68-20734

Chemical and thermal laser considered as an energy conversion system
p0176 A71-38939

HANDELSMAN, M.
Aerospace systems and mission analysis research - Solar electric space mission analysis Final report
[NASA-CR-106089] p0055 N69-38783

HANSEN, C. P.
Laser power stations in orbit.
p0257 A72-35328

HANSEN, G.
Lithium-nickel sulfide batteries
p0262 A71-13041

HANSEN, L. K.
Basic research in thermionic energy conversion
Technical summary report, 1 Aug. 1968 - 30 Nov. 1969
[AD-700945] p0232 N7C-26947

HANSON, K. L.
A design concept for a 30 watts per pound rollup solar array.
p0025 A69-42560

The "hot spot" failure mode for solar arrays.
p0028 A69-42273

Nimbus 2 - Photovoltaic power systems on flight spacecraft
[NASA-CR-62045] p0202 N68-24455

Rollup subsolar array. Volume 2 - Detailed test results Final report
[NASA-CR-118006] p0061 N71-23710

Feasibility study of a 110 watt per kilogram lightweight solar array system
[NASA-CR-130287] p0066 N73-15079

HANSON, L. A.
Heavy water organic cooled reactor. The preparation of uranium carbide from economical uranium compounds
[AI-CE-73] p0078 N68-11281

HARA, T.
Electrode voltage drop in a seeded plasma.
p0128 A68-24872

HARLAMBERT, P.
Flat-plate collector performance evaluation. The case for a solar simulation approach
[NASA-TM-X-71427] p0068 N73-32655

HARLOW, F. H.
A theoretical study of geothermal energy extraction.
p0075 A73-16382

HARNEY, B. H.
The remote sensing of air pollution from coal utilization
p0101 N72-29363

HARPSTER, J. W.
Effects of positive ion implantation into antireflection coating of silicon solar cells
[NASA-CR-131090] p0066 N73-19059

HARRINGTON, F. E.
Comparative evaluation of sol-gel fuel fabrication costs
[ORNL-TM-1979] p0078 N68-12553

HARRIS, E. G.
Stability of Tokamaks
[ORNL-TM-2766] p0230 N70-19953

HARVEY, A. E.
Large superconducting baseball magnet, part 1
[UCRL-71010] p0218 N69-22640

HARVEY, J. E.
Flywheel feasibility study and demonstration
[PB-200143] p0266 N72-11410

HASBACH, W. A.
Deployment techniques developed for large area roll-out solar arrays
p0031 A70-11932

Lightweight solar panel development
[NASA-CR-117349] p0061 N71-20727

Design and development of a 66-W/kq 23-m square roll up solar array
p0061 N71-22561

The development, design and test of a 66 W/kq (30-W/lb) roll-up solar array
[NASA-CR-128196] p0065 N72-32770

HASINGER, S.
Performance characteristics of electro-ballistic generators.
[AGARDOGRAPH 81] p0124 A68-22536

Performance characteristics of electro-ballistic generators, part C
p0198 N68-17816

HATCH, J. E.
Energy conversion apparatus Patent
[NASA-CASE-XLE-00212] p0235 N72-34134

HAUG, W.
Power limitation of an incandescent thermionic cell
p0172 A71-25894

Results of studies on thermionic reactor systems
[REPT.-68-007] p0201 N68-21856

HAUSER, C. H.
Topics on Rankine cycle power systems technology
p0208 N69-12577

- HALES, H.**
Experimental techniques in electro-fluid dynamic energy conversion research. p0124 A68-22538
[AGARDOGRAPH 81]
Experimental techniques in electro-fluid dynamic energy conversion research, part E p0198 N68-17818
Working media for electrofluid dynamic generators p0216 N69-18444
- HAWKINS, W. K.**
Gamma-ray logging in uranium prospecting [SN-112/15] p0084 N69-30790
- HAY, H. H.**
Initiation of spherical detonation in acetylene-oxygen mixtures [BM-RI-7061] p0116 N68-12434
- HAYNES, W. P.**
Clean automotive fuel: Laboratory-scale operation of the synthane process [TPR-49] p0099 N72-18760
- HAYS, L. G.**
A progress report on the JPL liquid-metal MHD cycle p0167 A70-39986
Analysis of a multistage liquid metal magnetohydrodynamic power conversion cycle [NASA-CR-100500] p0217 N69-21376
- HAZARD, H. E.**
Gas turbine fuels. p0071 A68-35741
- HEANEY, J. B.**
Results from the ATS 3 reflectometer experiment p0061 N71-25311
- HEARLD, A. B.**
Application of radioisotopes for aerospace waste reclamation and water systems [AMRL-TR-67-158] p0080 N68-21041
- HEATH, A. E., JR.**
The geometric properties of an expandable whirling-membrane solar-energy concentrator [NASA-TN-D-4532] p0048 N68-22258
Review of solar concentrator technology [NASA-TN-X-59043] p0049 N68-27643
Geometric properties of a modified whirling-membrane solar-energy concentrator [NASA-TN-D-5859] p0058 N70-29807
- HEATH, C. A.**
A reactor concept for space power employing thermionic diodes and heat pipes. [AIAA PAPER 68-122] p0120 A68-17540
Nuclear thermionic space power system concept employing heat pipes [NASA-TN-D-4299] p0200 N68-19146
- HECK, C. K.**
Hydrocarbon fuels for advanced systems [AD-737372] p0100 N72-23806
- HEFFELS, K. H.**
Primary energy sources and conversion systems p0056 N70-11303
Thin-film solar cells p0058 N70-30231
- HEINECKE, J.**
New methods for the fabrication of solar arrays p0031 A70-12080
- HEINICKE, J.**
Developments in solar cell generators. p0042 A73-22439
- HELGESEN, K. A.**
Research on the properties of binary liquid metal systems with lithium as one component - The electrical resistivity of liquid lithium saturated with cesium Final report [NASA-CR-110370] p0233 N70-29729
- HELLER, J. A.**
Status of advanced Rankine power conversion technology [GESP-623] p0174 A71-33525
Topics on Rankine cycle power systems technology p0208 N69-12577
Study of a 300-kilowatt Rankine-cycle advanced nuclear-electric space-power system [NASA-TN-X-1919] p0226 N70-11975
- HELWA, W. H.**
Experimental measurements of concentrated solar energy pattern in focus of a plane segments concentrator. p0025 A68-41092
- HENDERSON, H. T.**
Hydrocarbon fuels for advanced systems [AD-737372] p0100 N72-23806
- HENDERSON, H. E.**
Thermally regenerative fuel cells p0199 N68-17825
- HENDERSON, W.**
Proposed stratigraphic controls on the composition of crude oils reservoid in the Green River formation, Uinta Basin, Utah. p0076 A73-25471
- HENGLE, J. E.**
Nuclear power system study. p0184 A73-22799
- HENKES, W. C.**
Satellite monitoring of open pit mining operations [BM-IC-8530] p0107 N73-24432
- HENNE, R.**
Thermionic energy conversion with a Ba-Cs-diode. p0180 A72-34603
- HENNING, C. D.**
Large superconducting baseball magnet, part 1 [UCRL-71010] p0218 N69-22640
- HENRY, H. R.**
Investigations using data in Alabama [E73-10509] p0107 N73-22284
- HENRY, R. J.**
The fuel cell concept - A review of basic principles [DLR-MITT-70-09] p0239 N71-15723
- HERCHAKOWSKI, A.**
Multi-fuel 100 watt TE generator. p0121 A68-17827
- HERNDON, H.**
Microwave power rectification with commercial Schottky barrier diodes p0164 A70-21274
- HERTZBERG, A.**
Review of controlled fusion research using laser heating. [AIAA PAPER 73-258] p0183 A73-17667
- HERWIG, L. O.**
An assessment of solar energy as a national energy resource [NASA-CR-133101] p0068 N73-26818
- HESSE, E. W.**
EQUICORE - A space dependent code to assess the nuclear and thermal performance of SGHW and similar reactors [TRG-1808] p0230 N70-22307
- HEUSINKVELD, H.**
One-dimensional calculations on a finite-length MHD induction generator. p0149 A69-27494
One-dimensional calculations on a finite-length MHD induction generator [UCRL-70795] p0205 N68-31910
One-dimensional calculations on a finite-length MHD induction converter [UCRL-50537] p0221 N69-28635
- HEVER, G. E.**
Flywheel feasibility study and demonstration [PB-200143] p0266 N72-11410
- HEWIG, G. E.**
Investigations of the inhomogeneity of polycrystalline Cu/x/S-CdS solar cells. p0041 A73-14222
- HEYWOOD, J. B.**
End region of a single-load crossconnected M.H.D. generator. p0128 A68-25596
Optimization studies on open-cycle MHD generators. p0133 A68-39724
Current distribution around a normal shock in an MHD duct. p0146 A69-25359
- HIBBEN, S. G.**
Recent Soviet investigations in geothermy [AD-750128] p0104 N73-15454
- HICKEL, R. O.**
Brayton cycle systems p0208 N69-12578
- HILBORN, H. S.**
Savannah River Laboratory isotopic power and heat sources. Part 1 - Co-60 Quarterly progress report, Oct. - Dec. 1968 [DP-1192-1] p0086 N69-31541
- HILDEBRANDT, A. F.**
Large-scale concentration and conversion of solar energy. p0039 A72-36075

- HINA, A.
Reflections on heliothermic transformation of
direct solar radiation
p0069 N73-33767
- HIMMELSTEIN, P.
Technological improvement in the fabrication of
cast uranium carbide rods Final report
[EUR-4273-D] p0086 N69-34967
- HIOHTA, M.
Range and flight economy of power gliders
p0073 A69-43142
- HIROTOSHI, T.
Research on radioactive dust in the air at KUR
operation
[KUREI-TR-56] p0091 N70-21010
- HOARD, E. G.
Applicability of NASA contract quality management
and failure mode effect analysis procedures to
the USGS Outer Continental Shelf oil and gas
lease management program
[NASA-TM-X-2567] p0100 N72-25955
- HODGSON, J. M.
A SNAP-8 breadboard system. Operating experience.
[NASA-TM-X-61161] p0264 N68-33238
- HODGSON, R.
The electrical conductivity in argon potassium and
helium potassium plasmas with elevated electron
temperatures in crossed electric and magnetic
fields
[IIPP-3/59] p0190 N68-10892
- HOEY, M.
Remarks concerning solar furnaces in space.
p0039 A72-37675
- HOFFMAN, E. L.
Review of solar concentrator technology
[NASA-TM-X-59043] p0049 N68-27643
- HOFFMAN, M. A.
The M.I.T. non-equilibrium MHD generator.
p0144 A69-23471
- HOGLUND, R. F.
Thermodynamics of MHD energy conversion.
[AGARDGRAPH 81] p0123 A68-22530
Combustion and propulsion
[AGARDGRAPH-81] p0195 N68-17793
Thermodynamics of MHD energy conversion
p0197 N68-17810
- HOLCOMB, R.
Controlled fusion - Plasma heating with lasers
p0164 A70-22249
- HOLLAND, J. R.
Transit analysis
[SC-RR-69-662] p0091 N70-21251
- HOLLAND, J. W.
Thermionic fuel element development status summary.
p0076 A73-22819
- HOLLAY, E.
Solar cells for onboard energy supply in space
vehicles
p0024 A68-33039
- HOLMAN, E. R.
Exploring a closed Brayton cycle MHD power system
applying NERVA reactor technology
[AIAA PAPER 70-1225] p0170 A70-45956
- HOLMES-SIEDLE, A.
Study to determine and improve design for
lithium-doped solar cells Quarterly report, 1
Oct. - 31 Dec. 1970
[NASA-CR-116220] p0060 N71-16472
- HOLMES, J. M.
Energy intensive and heat intensive processes for
a nuclear energy center
p0014 N70-14506
- HOLMSTROM, J. S.
A radiantly heated radioisotope-powered thermionic
generator.
p0128 A68-24403
- HOLZAPFEL, C.
Applied magnetohydrodynamics, no. 3
[JUL-510-TP] p0201 N68-21331
Applied magnetohydrodynamics, Issue 6 -
Parametric studies and dimensioning of noble gas
MHD generators
[JUL-706-TP] p0242 N71-27918
Applied magnetohydrodynamics, No. 7: Electrical
losses in the MHD generator
[JUL-742-TP] p0245 N72-11639
- HONEYER, W. G.
100 kwe thermionic power system design.
p0186 A73-26026
- HOOPER, S. N.
The isolation of a series of acyclic isoprenoid
alcohols from an ancient sediment - Approaches
to a study of the diagenesis and maturation of
phytol.
p0076 A73-25465
- HOREFF, T. G.
Propulsion fuel system fire safety
p0094 N70-40779
- HORST, R. B.
Thermoelectric-thermomagnetic energy converter
staging.
p0138 A68-42954
- HORVATH, A.
Anion-exchange behavior of light rare earths in
aqueous methanol solutions containing neutral
nitrates. 2 - Macro-micro separations
[ANL-TRANS-538] p0192 N68-12691
- HORVATH, J.
Design and test evaluation of a liquid metal
regenerator for gas turbines.
[ASME PAPER 72-GT-33] p0178 A72-25629
- HOUBEN, J. W. M. A.
The effects of electrode configuration on the
performance of a Faraday type MHD generator.
p0179 A72-29353
MHD power conversion employing liquid metals
[TH-69-E-06] p0222 N69-31249
- HOULT, D. P.
The spread of oil in the Arctic.
[AIAA PAPER 73-701] p0076 A73-36250
Effective stack heights for tall stacks
[PHL-PUBL-71-14] p0098 N72-16934
- HOVEL, R. J.
High-efficiency Ga/1-x/Al/x/As-GaAs solar cells.
p0040 A73-10132
- HOWARD, H. W., JR.
The identification of Naval fuels and natural
fluorophors in sea water by fluorescence
spectrometry
[AD-743703] p0102 N72-33736
- HOWARD, J. M.
Unmanned reactor-thermoelectric systems for
applications in the 1970's.
p0186 A73-26024
- HOWARD, R. C.
Development of a 100 watt/e/ isotope thermionic
electrical power module.
p0155 A69-29190
SNAP-13 generator development program.
p0155 A69-29191
- HOWELL, J. R.
Device for directionally controlling
electromagnetic radiation Patent
[NASA-CASE-XLE-01716] p0059 N70-40234
- HSU, Y.-Y.
Slug flow magnetohydrodynamic generator
[NASA-CASE-XLE-02083] p0225 N69-39983
- HU, W. W.
Transient solidification outside a cooled pipe
with application to a solar Brayton heat receiver
[NASA-TN-D-4897] p0052 N69-10227
- HUDDIE, D.
Economics of propulsion systems for air transport.
I
p0008 A71-27542
- HUETTER, U.
Operating experience obtained with a 100 kW wind
power plant
[NASA-TT-P-15068] p0111 N73-29008
The development of wind power installations for
electrical power generation in Germany
[NASA-TT-P-15050] p0111 N73-29009
- HUGHES, W. F.
An analysis of the operation and stability of the
constant-velocity MHD Hall generator.
p0138 A68-43068
Experimental investigations of an open-cycle,
vortex MHD generator
[BM-RI-7699] p0251 N73-14746
- HUGHES, W. L.
Performance studies on a rechargeable
hydrogen-oxygen fuel cell.
p0186 A73-25988

- BOLETT, S. H.**
Environmental radiation levels and concentrations
Second half and annual summaries, 1967
[GAT-553] p0010 N68-25106
- BOHRENIK, F. E.**
Conversion of an experimental turbojet combustor
from ASTM A-1 fuel to natural gas fuel
[NASA-TN-X-2241] p0094 N71-20533
- BURN, R. W.**
Influence of volatile fuel components on vehicle
emissions
[BM-RI-7291] p0117 N70-20511
Comparative emissions from some leaded and
prototype lead-free automobile fuels
[BMRI-7390] p0092 N70-28685
- BURRELL, H. G.**
Topics on Rankine cycle power systems technology
p0208 N69-12577
Startup testing of the SNAP-8 power conversion
system
[NASA-TN-X-52822] p0233 N70-29864
- IAPRAT, O. J.**
Electromechanical energy conversion devices
utilizing both conventional and rare earth
cobalt permanent magnet materials
[AD-756433] p0252 N73-22168
- IAGLENKO, V. T.**
Mercury flow with a hydraulic shock in a channel
situated in a transverse magnetic field
p0149 A69-27499
- IAKIMENKO, V. L.**
Thermodynamic analysis of a closed cycle with an
MHD generator and an MHD compressor
p0131 A68-31226
Closed-loop cycle composed of an MHD generator and
a compressor with a heavy-gas flow
p0134 A68-41272
Thermodynamic analysis of a closed cycle with a
MHD-generator and MHD-compressor.
p0140 A69-14152
- IAKIMOVICH, K. A.**
Thermodynamic analysis of new liquid-metal
MHD-generator cycles
p0148 A69-27489
- IAKUBOV, I. U.**
Calculation of the solar radiation incident on an
inclined ribbed surface
p0040 A72-43194
- IAL'NITSKII, L. P.**
Theoretical investigation of combustion-product
parameters for a natural gas burning in oxygen
p0075 A72-29451
- IAUTOVSKII, E. I.**
Selection of the flow regime in an MHD generator
with series-connected electrodes
p0122 A68-19561
Investigation of a liquid-metal induction MHD
generator
p0151 A69-27513
- IBBERSON, V. J.**
M.H.D. research - Present and future.
p0146 A69-24469
A combustion oscillator for MHD energy conversion
p0175 A71-38099
- ICENHOWER, D. E.**
Optimizing power efficiency of hydrazine-oxygen
fuel cells.
p0187 A73-29598
High power density hydrazine fuel cells.
p0188 A73-38398
High-power density hydrazine fuel cells
[AD-764530] p0255 N73-33009
- IGNATENKO, M. M.**
Electrical field in an MGD-channel of a
rectangular section with semiterminal electrodes
[NASA-TT-F-12010] p0214 N69-14070
- ILES, P. A.**
How mechanical requirements affect silicon
solar-cell costs
p0033 A70-41008
Increased output from silicon solar cells
p0034 A71-16102
Increased output from silicon solar cells.
p0038 A72-28026
Evolution of silicon solar cell design.
p0040 A73-14204
- Lithium solar cell technology.
p0041 A73-14242
- IRANI, K.**
A shock tube study of nonequilibrium MHD power
generation.
p0140 A69-12425
- INGLE, B. D.**
Isotope Brayton electric power system for the 500
to 2500 watt range.
p0184 A73-22793
Development of a 1200-hertz alternator and
controls for space power systems
[NASA-TN-X-52453] p0205 N68-31042
- IOBDANISHVILI, E. K.**
Thermoelectric power supplies
[AD-690786] p0227 N70-13348
- IOSIPYAN, S.**
Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- IRISH, K.**
Construction and test of an MHD generator channel
and electrical power converter
[AD-758783] p0253 N73-25106
- ISACHSEN, Y. W.**
To evaluate ERTS-A data for usefulness as
geological sensor
[E72-10020] p0101 N72-29272
- ISANUKHAMEDOVA, E. S.**
Semiconductor solar energy converters and the
phenomenon of photo conductivity quenching
[AD-743031] p0064 N72-31083
- ISANUKHAMEDOVA, M. S.**
Semiconductor solar energy converters and the
phenomenon of photoconductivity quenching
p0034 A70-46325
- IVANOV, A. B.**
Oxide materials for hot channel of open cycle MHD
generator
p0243 N71-35627
- IVANOV, I. A.**
Investigation of a liquid-metal jet MHD generator
p0151 A69-27511
- IVANOV, P. O.**
Determination of the stabilization time of the
nonequilibrium state at the entrance to a
MHD-generator channel.
p0122 A68-19914
- IVANOV, P. P.**
Magnetohydrodynamic generator for a combined
magnetohydrodynamic electric power plant with a
first generation open cycle
[AD-764925] p0254 N73-31996
- IZ'YUROVA, A. I.**
The rate of oxidation of petroleum products in
water without addition of nitrogen
[NLL-NSTIC-TRANS-2474-(6180.59)] p0097 N71-37701
- JACK, J. E.**
Solar absorptances and spectral reflectances of 12
metals for temperatures ranging from 300 to 500 K
[NASA-TN-D-5353] p0055 N69-31895
- JACKSON, J. E.**
Electrical power distribution and usage
p0258 N71-20975
- JACKSON, W. D.**
Recent developments in closed-cycle plasma MHD
systems.
p0126 A68-22960
Liquid metal MHD power generation.
p0138 A68-42582
Critique of MHD power generation
[ASME PAPER 69-WA/PWR-12] p0163 A70-14754
Experimental study of a one-wavelength MHD
induction generator
p0167 A70-39988
MHD power generation
p0176 A71-40020
- JACQUEMIN, J. P.**
Experimental results of MHD conversion using a
rare gas
p0144 A69-23475
- JAECKEL, G.**
The determination of sulphur in petroleum products
[NSTIC/13106/67] p0079 N68-15630

- JANCZYSH, J.**
On the feasibility of the determination of water, salt and sulphur in crude oil by means of neutron activation analysis
p0089 N70-15280
- JAMES, G. S.**
Eleventh AFOSR Contractors' Meeting on Non-Chemical Energetics - Summaries of research [AFOSR-68-1377]
p0206 N68-31928
- JANIK, E.**
Advances in graded gap solar cell research.
p0040 A73-14207
- JANNOT, M.**
Influence of thermal and electric contact resistances on the output of thermoelectric-conversion generators
p0147 A69-26364
- JANSEN, P.**
Supplementary material to the report nuclear fuel requirements and costs of various reactor types in Germany, KFK 366 [KFK-466]
p0081 N68-22608
An approach to compare air pollution of fossil and nuclear power plants [CONF-700810-20]
p0016 N71-13756
- JARBY, R. L.**
Work plan for continuation of the project reduction of atmospheric pollution by the application of fluidized bed combustion [ANL/ES-CEN-1003]
p0096 N71-36736
- JASINSKI, E.**
Lithium-nickel sulfide batteries
p0262 A71-13041
- JEDLIKA, J.**
A solar engine using the thermal expansion of metals.
p0046 A73-38473
- JEDLIKA, J. R.**
Solid medium thermal engine [NASA-CASE-ARC-10461-1]
p0252 N73-20931
- JEFFERIES, K. S.**
H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report. [IEEC PAPER 739028]
p0116 A73-38436
Startup testing of the SNAP-8 power conversion system [NASA-TN-X-52822]
p0233 N70-29864
- JENIN, P.**
Direct electrochemical conversion of the energy of a radioactive element
p0142 A69-21054
- JENKINS, W. R.**
Large-scale concentration and conversion of solar energy.
p0039 A72-36075
- JENQUIN, U. P.**
Phoenix fuel evaluation in a maritime reactor design [BNWL-851]
p0082 N69-15543
- JERKE, J. H.**
The geometric properties of an expandable whirling-membrane solar-energy concentrator [NASA-TN-D-4532]
p0048 N68-22258
Performance of an expandable whirling membrane solar energy concentrator [NASA-TN-X-59872]
p0049 N68-27564
Performance of an expandable whirling membrane solar energy concentrator [L-5484]
p0049 N68-27926
Geometric properties of a modified whirling-membrane solar-energy concentrator [NASA-TN-D-5859]
p0058 N70-29807
- JESTER, J. L.**
Characteristics of a finite length M.H.D. traveling wave cylindrical accelerator or generator
p0204 N68-30018
- JESTER, H. H. L.**
Rankine cycle systems studies for nuclear space power [UCRL-79863]
p0218 N69-23173
- JETT, E. S.**
Two-terminal connected open cycle MHD generators. MHD generator in two-terminal operation.
p0127 A68-23920
p0132 A68-39717
- JOHNSON, C. C.**
Investigation of synchronous-wave RF to dc conversion Final report, 1 Jun. 1966 - 31 Dec. 1967 [REPT.-4]
p0205 N68-30681
- JOHNSON, J. K.**
Low-power-consumption auxiliaries for fuel-cell power systems
p0170 A70-43539
- JOHNSON, K. O.**
Subassembly test program outline for FY 1969 and 1970 [IN-1313]
p0088 N70-13396
- JOHNSON, P. W.**
Segmented electrode effects in MHD flows with Hall currents.
p0126 A68-23918
- JOHNSON, R. C.**
Tables of critical-flow functions and thermodynamic properties for methane and computational procedures for both methane and natural gas [NASA-SP-3074]
p0104 N73-15309
- JOHNSON, R. H.**
Analysis of an optical motor system energized with a laser.
p0142 A69-22457
- JOHNSON, R. L.**
Subassembly test program outline for FY 1969 and 1970 [IN-1313]
p0088 N70-13396
- JOHNSON, R. T.**
Subassembly test program outline for FY 1969 and 1970 [IN-1313]
p0088 N70-13396
- JOHNSON, W. E.**
Energy sources of tomorrow
p0095 N71-29852
- JONES, J. E., JR.**
Physics, thermal hydraulic, and fuel cycle cost analyses of a metallic uranium direct replacement for PWR'S [ORNL-TN-2493]
p0088 N70-12423
A study of metallic uranium fueled pressurized water reactors for the production of process heat or electric power [ORNL-TN-2451]
p0232 N70-25646
- JONES, L. W.**
Liquid hydrogen as a fuel for the future
p0115 A71-44365
- JONES, N. A.**
Electrical power distribution and usage
p0258 N71-20975
- JONES, R. E.**
Comparison of combustion characteristics of ASTM A-1, propane, and natural-gas fuels in an annular turbojet combustor [NASA-TN-D-7135]
p0104 N73-16771
- JONKE, A. A.**
Work plan for continuation of the project reduction of atmospheric pollution by the application of fluidized bed combustion [ANL/ES-CEN-1003]
p0096 N71-36736
- JORDAN, S.**
An approach to compare air pollution of fossil and nuclear power plants [CONF-700810-20]
p0016 N71-13756
- JOSLIN, C. L.**
The potential of methane as a fuel for advanced aircraft.
p0071 A68-33439
- JOUYS, J.-C.**
Study of the electrical behavior of various magnetohydrodynamic generators using explosives [CEA-R-3714]
p0222 N69-30678
- JOYCE, J. P.**
H2-O2 auxiliary power unit for Space Shuttle vehicles - A progress report. [IEEC PAPER 739028]
p0116 A73-38436
- JUNGE, H. J.**
Calculation model for Hall type electromagnetic plasma accelerators
p0146 A69-25214
- JUNGER, J. H.**
Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements [EUR-4243.F]
p0085 N69-31119

JUNG, J. H.
On the mechanism of the generation of petroleum
p0078 N68-10414

JUSTI, R. H.
Investigations on CdTe thin film solar cells.
p0045 A73-30475

K

KACHANOV, P. V.
An O-shaped unsaturated magnetic system with two
excitation coils designed for MHD- machinery.
p0143 A69-23102

KAFAROVA, G. H.
Electrode materials based on silicon carbide for
open cycle MHD generators
p0243 N71-35623

KAISER, W.
Pulsed thermonuclear reactor operated with lasers
[AEC-TR-7148]
p0237 N70-38825

KAKABAIEV, A.
Calculation procedures and energetic
characteristics for cooling systems with an
atomizing-nozzle chamber and solar heaters
p0037 A72-24314

KALSON, B.
Environmental radiation levels and concentrations
Second half and annual summaries, 1967
[GAT-553]
p0010 N68-25106

KAMILDZHANOV, A. K.
Film solar energy collector with concentric
circular seams
[AD-755829]
p0067 N73-21712

KAMIYAMA, T.
Trend in atomic power generation and uranium
resources
[ORNL-TR-1825]
p0081 N68-28954

KANE, J. S.
Development of materials for energy related
applications
[UCRL-74697]
p0022 N73-33005

KANT, H.
Development of a liquid flow MHD alternating
current generator
p0149 A69-27495

KANTHER, D. A.
Mapping of soil banks using ERTS-1 pictures
p0110 N73-28372

KAPELNER, S. H.
Research on the properties of binary liquid metal
systems with lithium as one component - The
electrical resistivity of liquid lithium
saturated with cesium Final report
[NASA-CR-110370]
p0233 N70-29729

KAPLAN, E.
Design and performance of a mobile waste heat
organic Rankine cycle system providing electric
power and environmental control.
p0162 A69-42267

KARAGEORGII-ALKALAEV, P. H.
Semiconductor solar energy converters and the
phenomenon of photoconductivity quenching
p0034 A70-46325

KARAGEORGII-ALKALAEV, P. H.
Semiconductor solar energy converters and the
phenomenon of photo conductivity quenching
[AD-743031]
p0064 N72-31083

KARASEV, V. G.
Experimental investigation of liquid-metal MHD
generators
p0151 A69-27512

KARBAN, V. I.
Chemism and physicochemical properties of
processes of microbiological oxidation of
petroleum hydrocarbons
[JPRS-48150]
p0084 N69-29789

KARZEV, I. A.
Cesium-doped mercury as a working fluid for
studying the specific features of MHD generators
based on a Rankine cycle
p0143 A69-23458

KAREYEV, YU.
Parameters of magnetohydrodynamic /MHD/-generators
taking into account ionization instability of
plasma
[FTD-MT-24-205-67]
p0206 N68-35442

KARIUS, S.
Solar cells and solar-cell generators for space
travel
p0025 A68-41941

KARIZHEVSKII, E. IA.
Thermal activity of the Uson Caldera based on
infrared and photographic aerial survey.
p0077 A73-39895

KAROL, I. L.
Global contamination of the atmosphere by
krypton-85 from worldwide nuclear power plants
and the radiation danger
[JPRS-53174]
p0016 N71-26623

KARPUGHIN, V. I.
Cesium-doped mercury as a working fluid for
studying the specific features of MHD generators
based on a Rankine cycle
p0143 A69-23458

Study of electrodes made refractory metals for MHD
generators utilizing nonequilibrium conductivity
[SM-74/92]
p0210 N69-13319

Hg and Cs as working media for studies of certain
properties of MHD generators working in a
Rankine cycle
[SM-107/130]
p0214 N69-15430

KASCAK, A. F.
The potential of nuclear power for high-speed
ocean-going air-cushion vehicles
[NASA-TN-X-1871]
p0013 N69-35723

KATSELSON, S. S.
Design of an MHD generator with an electric
conductivity waveform at small magnetic Reynolds
numbers
p0156 A69-29911

KAUFMAN, G. H.
Reward and uncertainty in exploration programs
[NASA-CR-129595]
p0103 N73-13991

Two stochastic models useful in petroleum
exploration
[NASA-CR-129611]
p0103 N73-13992

KAUFMAN, S. J.
Nuclear reactor heat sources for future power
generation
p0012 N69-12576

KAWADA, H.
A shock tube study of nonequilibrium MHD power
generation.
p0140 A69-12425

KAWAHARA, F. K.
Radioisotopic power generators State of the art
report
[AD-687131]
p0223 N69-32804

KAYKATI, G. H.
Analysis of the maximum performance of a
paraboloidal solar collection system for space
power
[NASA-TN-D-4415]
p0047 N68-18998

KATUKAWA, H.
Optimization of the MHD-generator using a liquid
metal as a working medium
[DLR-PB-67-71]
p0193 N68-14746

KAZAKOV, YE. A.
Isotopic electric power sources for
radiometeorological stations
p0201 N68-21974

KAZOVSKII, E. Y.
Superconductors in marine technology
[AD-755711]
p0252 N73-22702

KEELER, D. P.
Investigation of Navy aircraft fuel dispensing
methods
[AD-748211]
p0267 N73-13997

KELINSHENZ, P.
Utilization of wind power by means of elevated
wind power plants
[NASA-TT-F-14903]
p0107 N73-23011

KELLEY, C. H.
High-temperature thermoelectric material
limitations.
[AGARDGRAPH 81]
p0125 A68-22540

High-temperature thermoelectric material limitations
p0198 N68-17820

KELLY, C. E.
MHD converter design and performance summary.
p0189 A73-38419

Performance models for the MHD converter.
p0189 A73-38422

- KELSEY, E. L.**
A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.
p0186 A73-25984
- Power and load priority control concept for a Brayton cycle power system
[NASA-TN-D-6478]
p0244 A71-36452
- KENDALL, D. L.**
Development and fabrication of lithium-diffused silicon solar cells. Final report, 18 Aug. - 31 Jan. 1968
[NASA-CR-97077]
p0051 N68-35814
- KENNERUD, K. L.**
A technique for identifying the cause of performance degradation in cadmium sulfide solar cells.
p0028 A69-42271
- Analysis of performance degradation in CdS solar cells
p0031 A70-15329
- KENNY, D. P.**
High pressure ratio centrifugal compressors for small gas turbine engines
p0172 A71-24218
- KENNY, R. P.**
Clean automotive fuel: Laboratory-scale operation of the synthane process
[TPR-49]
p0099 N72-18760
- KEREV, Ya. A.**
Hg and Cs as working media for studies of certain properties of MHD generators working in a Rankine cycle
[SM-107/130]
p0214 N69-15430
- KERR, R. T.**
ROD: A nuclear and fuel cycle analysis code for circulating fuel reactors
[ORNL-TM-3359]
p0098 N72-17737
- KERR, R. L.**
Regenerative fuel cells
p0203 N68-28735
- KERREBROCK, J. L.**
The M.I.T. non-equilibrium MHD generator.
p0144 A69-23471
- Research on nonequilibrium MHD generators
[AD-740572]
p0248 N72-29734
- KERWIN, P. T.**
Analysis of a 35- to 150-kilowatt Brayton power-conversion module for use with an advanced nuclear reactor
[NASA-TN-D-6525]
p0243 N71-35233
- KESSLER, R.**
Effects of electrode and boundary-layer temperatures on MHD generator performance.
p0126 A68-23911
- Effects of electrode and boundary-layer temperatures on MHD-generator performance.
p0132 A68-39715
- KESTEN, A. S.**
Analytical study of catalytic reactors which promote endothermic reactions of hydrocarbon fuels.
[AIAA PAPER 69-588]
p0672 A69-33265
- KETTANI, M. A.**
Direct energy conversion
p0171 A71-11193
- KHALKIN, V. A.**
Anion-exchange behavior of light rare earths in aqueous methanol solutions containing neutral nitrates. 2 - Macro-micro separations
[ANL-TRANS-508]
p0192 N68-12691
- KHIZHENIAK, N. A.**
Energy characteristics of a coaxial plasma source.
p0115 A72-26754
- KHOLSHCHEVNIKOVA, YE. K.**
The integral characteristics of a magnetohydrodynamic generator with two pairs of finite-length electrodes
p0192 N68-11664
- KHOPTA, G. N.**
The dependence of gas production costs on the degree of oxygen blast enrichment during gasification of lignite under pressure
p0117 N70-10885
- KHOZHAIKOV, A. I.**
Elements of the general transient-response theory of liquid-metal conduction MHD generators
p0150 A69-27506
- Elements of the general theory of transient work processes of liquid-metal MHD conduction type generators
[AD-680712]
p0220 N69-26620
- KIEPFER, A. W.**
Transfer function determination of the primary loop of a conceptual nuclear Brayton space powerplant
[NASA-TM-X-2193]
p0240 N71-17933
- Operating characteristics of the primary flow loop of a conceptual nuclear Brayton space powerplant
[NASA-TM-X-2161]
p0240 N71-18866
- KILLEEN, J.**
Computational problems in plasma physics and controlled thermonuclear research
[UCRL-71205]
p0207 N69-35919
- KIM, C. K.**
Effects of positive ion implantation into antireflection coating of silicon solar cells
[NASA-CR-131090]
p0066 N73-19059
- KIM, J.**
Radioisotopic power generators. State of the art report
[AD-687131]
p0223 N69-32404
- KIM, K. I.**
Liquid-metal MHD systems with laminar flow and electric power generation by the synchronous principle
p0148 A69-27491
- Rayleigh-Taylor instability and methods of stabilizing it in synchronous liquid-metal MHD generators
p0150 A69-27508
- Rayleigh-Taylor instability in liquid-metal synchronous MHD generators and methods of stabilizing it
[AD-685487]
p0221 N69-29892
- KING, A. E.**
Electrical component technology for 0.25 to 10.0 megawatt space power systems, design study. Quarterly technical progress report, Mar. 1, 1966 - May 31, 1967
[SAM-679-3]
p0191 N68-10967
- Electrical component technology for 1/4 to 10 megawatt space power
[CONF-680802-1]
p0206 N68-34481
- KING, W. G.**
Fabrication feasibility study of a 30 watt/pound rollup solar array. Final report
[NASA-CR-97208]
p0052 N68-36634
- KINSHAW, P. E.**
ERTS-1 imagery use in reconnaissance prospecting: Evaluation of commercial utility of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10414]
p0105 N73-20376
- KIRBY, K. D.**
Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829
- KIREYEV, B. I.**
Data of gravimetric surveys and problems of direct search for oil and gas on the Monzhukly structure
[ACIC-TC-1217]
p0078 N68-10240
- KIRILLIN, V. A.**
Pulse MHD generator with a superconducting magnetic system
p0120 A68-16523
- A pulsed magnetohydrodynamic generator with a superconducting magnetic system.
p0131 A69-30774
- Magnetohydrodynamic Method of Obtaining Electrical Energy
p0141 A69-17905
- Certain problems in the operation of a installation with MHD generator
[SM-74/221]
p0212 N69-13336
- MHD methods of obtaining electrical energy - Annotation and preface
[AD-706160]
p0236 N70-37638
- Magnetohydrodynamic method of producing electrical energy, part 1
[JPRS-57940-1-PT-1]
p0251 N73-16687
- Magnetohydrodynamic method of producing electrical energy, part 2
[JPRS-57940-2-PT-2]
p0251 N73-16688

- KIRILLOV, I. B.**
Experimental investigation of liquid-metal MHD generators
p0151 A69-27512
- KIRILLOV, V. V.**
Experimental investigation of the characteristics of a nonequilibrium MHD generator
p0190 A73-39618
- KIRKMAN, P. S.**
Energy supply and its effect on aircraft of the future. II - Liquid-hydrogen-fueled aircraft: Prospects and design issues.
[AIAA PAPER 73-809]
p0009 A73-38373
- KIRKO, I. M.**
Mechanical electromagnet as an MHD dynamo
p0166 A70-28650
- KLANN, J. L.**
Performance of the electrically-heated 2 to 15 kwe Brayton power system
p0173 A71-32212
2 to 10 kilowatt solar or radioisotope Brayton power system
[NASA-TN-X-52438]
p0051 N68-31096
- KLEIN, S.**
On the behavior of energy conversion left from vapor ionized by fission products
p0196 N68-17808
- KLEINKAUF, W.**
Possible space application of nuclear power supply, particularly for direct TV-broadcasting
[BNBW-FB-W-70-16]
p0233 N70-30407
- KLEINMANN, E. E.**
Investigation of Navy aircraft fuel dispensing methods
[AD-748211]
p0267 N73-13997
- KLEPIS, J. E.**
Experimental studies with an arc-driven Hall MHD generator with strong MHD interaction.
p0127 A68-23921
Critique of MHD power generation
[ASME PAPER 69-WA/PWH-12]
p0163 A70-14754
Research on MHD energy conversion Final report
[AD-720257]
p0241 N71-26190
- KLINOV, S. G.**
Effect of sulfides contained in fuels on their operational properties
p0072 A69-19456
- KLIPPEL, E.**
Development of advanced solar cell modulus technology for use by solar probes and large area solar cell arrays
[RF-93-0]
p0048 N68-22010
- KLUCHER, T. E.**
Thermal cycling test of a flexible solar cell module
[NASA-TN-X-52995]
p0061 N71-21206
- KNIGHT, M.**
1 KVA three-phase DC-AC inverter with digital control.
p0162 A69-42294
- KNOERNSCHILD, E.**
The electrofluid dynamic energy converter with spacecharge neutralization
p0216 N69-18450
- KNUTH, W. M.**
Detection, delineation, and monitoring of subsurface coal fires by aerial infrared scanning
p0086 N69-33683
- KOBARENKOV, A. P.**
Device for investigating thermionic energy converters.
p0156 A69-34700
- KODYKOV, Y. M.**
Isotopic electric power sources for radiometeorological stations
p0201 N68-21974
- KOEHLER, F.**
New methods for the fabrication of solar arrays
p0031 A70-12080
- KOESTEL, A.**
Radiator design limitations for dynamic converters
p0195 N68-17796
- KOESTER, J. K.**
The performance of a family of diagonal conducting wall MHD open cycle generators
p0169 A70-40004
The performance of a family of diagonal conducting wall MHD open cycle generators
[AD-705159]
p0235 N70-32986
- KOELSUELLER, E.**
Construction and operation of a hydrazine-oxygen fuel cell module
p0170 A70-43541
Optimizing hydrazine-oxygen fuel cells
p0171 A71-14321
Controlling the input of the reactants in hydrazine-oxygen fuel cell aggregates
p0177 A72-18290
- KOIFMAN, E. I.**
New method of investigating the strength properties of typical rocks in some coal and shale deposits
p0083 N69-21442
- KOLB, G.**
Applied magnetohydrodynamics, no. 3
[JUL-510-TP]
p0201 N68-21331
Applied magnetohydrodynamics. Issue 6 - Parametric studies and dimensioning of noble gas MHD generators
[JUL-706-TP]
p0242 N71-27918
- KOLBENEV, I. L.**
Prospects for the application of high temperature fuel cells
[AD-727497]
p0244 N71-37624
- KOLENKO, E. A.**
Utilization of thermosiphons in the construction of thermoelectric devices
p0187 A73-30950
- KOLOSHITSYN, N. I.**
Calculation of magnetohydrodynamic flows and the problem of obtaining an optimal MHD generator
p0122 A68-18450
- KOLTUN, E. M.**
Selective surfaces and coatings in solar radiation engineering
p0037 A72-24315
Working of heliostations described
[JPRS-48222]
p0054 N69-30038
Selective surfaces and coatings in solar radiation engineering
[NASA-TT-P-14650]
p0066 N73-15598
- KOMAREK, P.**
Applied magnetohydrodynamics. Number 5 - MHD-nuclear power stations
[JUL-689-TP]
p0242 N71-30458
Applied magnetohydrodynamics, report no. 10, MHD-test facility Arqas 2: Description and operations
[NASA-TT-P-14876]
p0252 N73-22662
- KONASHCHENKO, V. N.**
Heterogeneous solar cells based on polycrystalline cadmium sulfide and selenide
p0033 A70-36238
Heterogeneous solar converters based on polycrystalline cadmium sulfide and gadmium selenide
[AD-756594]
p0067 N73-21960
- KOOI, C. Y.**
Thermoelectric-thermomagnetic energy converter staging.
p0138 A68-42954
- KORDESCH, K. V.**
Hydrazine-air fuel cells.
p0119 A68-13240
Low temperature-low pressure fuel cell with carbon electrodes.
p0139 A68-44779
Outlook for alkaline fuel cell batteries.
p0180 A72-33887
- KOROLEV, M.**
Space electric power plants, part 2
[AD-756039]
p0067 N73-21973
- KOROTKOV, M. P.**
Isotopic electric power sources for radiometeorological stations
p0201 N68-21974
- KORUBOV, I. I.**
Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- KORWIN-PAWLOWSKI, M.**
Gallium arsenide photoelectric detection devices
p0026 A69-27465

- KORYAGINA, M. G.
Magnetohydrodynamic generator for a combined magnetohydrodynamic electric power plant with a first generation open cycle
[AD-764925] p0254 N73-31996
- KORYU ISHII, T.
Analysis of an optical motor system energized with a laser. p0142 A69-22457
- KOSHKIN, K. E.
Empirical equation for the external characteristic of a photoelectric solar generator p0031 A70-19623
- KOSNATOV, S. L.
Some problems related to the conversion of chemical energy into mechanical work p0171 A71-16785
Some aspects of the conversion of chemical energy to mechanical work p0174 A71-33037
- KOSHIN, M. S.
Ultra-reliable power processor for hydrocarbon-air fuel cell power systems [AD-699311] p0231 N70-23985
- KOTYK, B. A.
Prospects for thermal water exploration in Transcarpathian region of Ukrainian SSR p0090 N70-16586
- KOVASIUK, V. I.
Analysis of a power source employing an MHD generator and a thermocompressor p0142 A69-21592
- KOVASYUK, V. I.
Plasma flow in the duct of a "series" MHD generator [SM-74/225] p0212 N69-13339
Magnetohydrodynamic generator for a combined magnetohydrodynamic electric power plant with a first generation open cycle [AD-764925] p0254 N73-31996
- KOVYUN, I. M.
Some problems related to the conversion of chemical energy into mechanical work p0171 A71-16785
Some aspects of the conversion of chemical energy to mechanical work p0174 A71-33037
- KOWALEWSKY, B.
Leak testing of containers and capsules for radioactive materials [NLL-RISLEY-TRANS-1865-/9091.9P] p0091 N70-20349
- KOZAMA, A.
Kinetic factors in fuel cell systems - The oxygen electrode p0199 N68-17824
- KOZHEVNIKOV, I. V.
Optimization of the tuning of gas turbine engines p0170 A70-43361
- KOZLOV, V. M.
Critical experiments with organic moderators - Monoisopropyl diphenyl and gas oil [FTD-HT-66-746] p0079 N68-12884
- KRAEMER, P. W.
Space experiment power supplies p0057 N70-24832
- KRASOVSKIY, M. V.
Project of wind motor with aerodynamic transmission for capacities of 100 kw to 3000 kw [NASA-TT-F-15131] p0111 N73-30976
- KRAUS, P.
On the behavior of energy conversion left from vapor ionized by fission products p0196 N68-17808
- KRAUSE, W. J.
Determination of uranium with a potential-controlled coulometric titrator [CNEA-192] p0079 N68-17192
- KRAWCZYK, R. J.
SERT 2 spacecraft electrical power system [NASA-TN-X-2234] p0061 N71-20471
- KRENLEV, M. G.
Superconductors in marine technology [AD-755711] p0252 N73-22702
- KRISHBERG, R. R.
Comparison of the characteristics of an ideal MHD induction converter during its pumping and generating modes of operation, taking into account the current conductivity of the channel walls p0151 A69-28887
- KRUCHOWY, R.
Turbine performance in a gas-bearing Brayton cycle turboalternator [NASA-TN-D-5604] p0227 N70-14220
- KRUGER, C. H.
Boundary phenomena in MHD generators Summary report, 15 Feb. 1966 - 15 Feb. 1968 [AFOSR-68-7859] p0202 N68-26537
Electrode temperature effect on MHD generator performance [AD-683793] p0220 N69-27071
- KRUMHOLTZ, K.
The determination of sulphur in petroleum products [NSTIC/13166/67] p0079 N68-15630
- KRUNIN, YU. K.
Ponderomotive forces acting upon conductive bodies in the traveling magnetic field of a cylindrical inductor p0195 N68-16292
- KRUPSTEDT, U.
Possible space application of nuclear power supply, particularly for direct TV-broadcasting [BMEW-FB-7-70-16] p0233 N70-30407
- KRUSE, M.
Dc power supply engineered magnetics model EMPS-252 for Brayton cycle power conversion system Final report [NASA-CR-72529] p0236 N70-36860
- KUDRIASHOVA, E. D.
Mechanical treatment of the collector surfaces of solar installations for improving the selectivity of optical properties p0031 A70-19625
- KUEPER, K. D.
Investigations into the dynamics of a nuclear closed-cycle gas turbine plant with high temperature reactor [NLL-WH-TRANS-271-/9091.9P/1] p0230 N70-21100
- KUEPER, F. P.
Plasma production and heating by laser radiation [NP-17453] p0204 N68-30330
- KUGLER, K.
Some problems of lignite gasification by means of high-temperature nuclear reactor heat [JUL-554-RG] p0264 N69-13298
- KUHN, H.
Technological improvement in the fabrication of cast uranium carbide rods Final report [EUR-4273.D] p0086 N69-30967
- KUKOTA, I. P.
Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition p0190 A73-39619
- KULSHRESHTHA, A. P.
Investigation on silicon p-n junction for solar energy conversion. p0024 A68-31623
- KURTZROCK, R., C.
Experimental investigations of an open-cycle, vortex MHD generator [BM-HI-7699] p0251 N73-14746
- KURZ, J. L.
Experimental electrode current distributions in MHD channels [SU-IPR-230] p0205 N68-31787
- KUSAIKOV, M. K.
One-dimensional flow of a plasma in a MHD energy converter channel. p0126 A68-23796
- KYLE, M. L.
Lithium/sulfur batteries for off-peak energy storage: A preliminary comparison of energy storage and peak power generation systems [ANL-7958] p0268 N73-30658
- KYLE, B. J.
Feasibility study 30 watts per pound roll-up solar array Final report [NASA-CR-96230] p0051 N68-32561

L

- LABOUNTY, R. B.**
Operation of a 20 Mw Hall generator. p0127 A68-23919
- LABOUSSE, M.**
Technical aspects and economic incidents of transportation in the fuel cycle [CEA-COMP-1093] p0257 N69-27096
- LACHOWSKI, H. H.**
Identification and mapping of coal refuse banks and other targets in the anthracite region [PAPER-L24] p0110 N73-28319
- LAFFERTY, R. B., JR.**
Sr 90 heat sources [ORNL-IIC-36] p0096 N71-35815
- LAPLEUR, J. D., JR.**
Nuclear energy source limitations for dynamic energy conversion systems p0195 N68-17794
- LALUDE, O. A.**
Thermal behavior and design of cellular matrix-porous bed solar thermal converters p0062 N71-28586
- LAMB, E.**
The availability and cost of curium-244 from power reactor fuel reprocessing wastes. p0077 A73-38430
- ORNL isotopic power fuels**
[ORNL-4750] p0100 N72-24703
- LAMBERT, R. J.**
Characteristics of solar cells at low temperatures. p0027 A69-35691
- LAMBERTI, J. M.**
Design and preliminary operation of the Lewis magnetohydrodynamic generator facility [NASA-TN-D-4867] p0207 N68-37259
- LANDER, H.**
Endothermic fuels for hypersonic vehicles. [AIAA PAPER 68-997] p0072 A68-45023
Endothermic fuels for hypersonic vehicles [AIAA PAPER 68-997] p0073 A71-24852
- LANDSHAM, A. P.**
Optical characteristics of silicon photocells and the efficiency of a thermal photoelectric converter p0023 A68-18449
- Optical characteristics of silicon photocells and the efficiency of a thermophotovoltaic converter.**
p0025 A68-39356
- LANE, J. A.**
Rationale for low cost nuclear heat and electricity p0014 N70-14505
- LANG, H.**
Applied magnetohydrodynamics, report no. 10, MHD-test facility Argas 2: Description and operations [NASA-TT-P-14876] p0252 N73-22662
- LANTZ, E.**
A reactor concept for space power employing thermionic diodes and heat pipes. [AIAA PAPER 68-122] p0120 A68-17540
Nuclear thermionic space power system concept employing heat pipes [NASA-TN-D-4299] p0200 N68-19146
- LAQUER, H. L.**
Energy storage and switching with superconductors [LA-DC-12990] p0267 N72-17829
- LAROCHE, J.**
Medium temperature fuel cells p0156 A69-32417
- LARSEN, L.**
Further infrared systems studies for the earth resources program Final report [NASA-CR-102111] p0089 N70-16407
- LATHERAM, E. B.**
Identification of geostructures of continental crust particularly as they relate to mineral resource evaluation [E73-10321] p0105 N73-18353
Identification of Geostructures of continental crust, particularly as they relate to mineral-resource evaluation [E73-11035] p0112 N73-31339
- LATOUR, A.**
Feasibility study 30 watts per pound roll-up solar array Final report [NASA-CR-96230] p0051 N68-32561
- LAURENT, J.-P.**
Conventional and "exotic" electrochemical energy generators p0120 A68-14861
- LAURENTEV, I. V.**
The integral characteristics of an MHD generator with diverging electrodes [AD-694396] p0227 N70-13251
- LAVEISSIERE, F.**
Isotopic electric generators [ORNL-TS-2485] p0244 N71-37044
- LAVERNIE, I. V.**
Experimental investigation of liquid-metal MHD generators p0151 A69-27512
- LAWRENCE, P. J.**
A collection of notes on diesel engine economics [REPT.-1] p0081 N68-24990
- LAWSON, L. J.**
Flywheel feasibility study and demonstration [PB-200143] p0266 N72-11410
- LAWSON, M. O.**
Performance characteristics of electro-fluid dynamic energy conversion processes employing viscous coupling. [AGARDOGRAPH 81] p0124 A68-22535
Ion generation by corona discharge for electrofluid energy conversion processes. [AGARDOGRAPH 81] p0124 A68-22537
- Electrofluid dynamic energy conversion - Present status and research areas**
[ASME PAPER 70-ENER-1] p0171 A71-13704
- Performance characteristics of electro-fluid dynamic energy conversion processes employing viscous coupling, part B**
p0198 N68-17815
- Ion generation by corona discharge for electro-fluid energy conversion processes, part B**
p0198 N68-17817
- Selected topics in electrofluid dynamic energy conversion**
[AGARDOGRAPH-122] p0215 N69-18439
- Electrofluid dynamic energy conversion processes characteristics and research areas**
p0215 N69-18441
- LAY, R. E.**
A survey of propulsion systems for low emission urban vehicles [PB-200144] p0097 N72-10830
- LAYTON, J. P.**
Aerospace systems and mission analysis research - Solar electric space mission analysis Final report [NASA-CR-106089] p0055 N69-38783
- LAZAREV, P. P.**
Optimum MHD generator with channel of constant cross section. p0130 A68-30712
- General analysis of an optimal MHD generator with a channel of constant cross-sectional area**
p0164 A70-24570
- LAZARIDIS, L.**
Six-converter solar thermionic generator /JG-4/ Quarterly progress report, 1 Jul. - 15 Dec. 1967 [NASA-CR-92586] p0046 N68-15766
Six-converter solar thermionic generator Final report, 10 Jan. 1967 - 31 Mar. 1968 [NASA-CR-98712] p0052 N69-14920
- LE BRONEC, J.**
Experimental results of MHD conversion using a rare gas p0144 A69-23475
- LE GRIVES, E.**
Limitations of solar collectors for converters [AGARDOGRAPH 81] p0024 A68-22525
Limitations of solar collectors for converters p0047 N68-17804
- LEARY, J. A.**
Solid solution oxide fuels for space electric power heat system [LA-DC-9686] p0264 N69-14302
- LEAVY, W. A.**
Switching mechanism with energy storage means Patent [NASA-CASE-XGS-C0473] p0265 N70-38713
- LEBRUN, J.**
Cadmium telluride photocells p0167 A70-38481

- LECLERC, P.**
Photovoltaic cells with concentrators
[AGARDGRAPH 81] p0125 A68-22547
Photo-voltaic cells with concentrators p0199 N68-17828
- LEE, G.**
Laser power stations in orbit. p0257 A72-35328
- LEE, J. D.**
Controlled thermonuclear power
[UCRL-71500] p0226 N70-12638
- LEE, J. S.**
The influence of variable thermal conductivity and
variable electrical resistivity on
thermoelectric generator performance. p0157 A69-40131
- LEGO, J.**
An impulse induction MHD generator having a
magnetic field with a radial component. p0145 A69-23484
- LEHNERT, B.**
Present situation and future prospects of
controlled nuclear fusion p0131 A68-32685
The future energy supply of the world
[REPT-69-11] p0013 N69-35574
- LEIGHTON, G. S.**
Electrical component technology for 1/4 to 10
megawatt space power
[CONF-680802-1] p0206 N68-34481
- LENGYEL, L. L.**
Two-dimensional current distributions in Faraday
type MHD energy converters operating in the
nonequilibrium conduction mode. p0146 A69-25397
Fields and flow in MHD channels. p0157 A69-39480
- LEMOIR, J.**
Direct electrochemical conversion of the energy of
a radioactive element p0142 A69-21054
- LEONARD, J. W.**
Suppression of evaporation of hydrocarbon liquids
and fuels by aqueous films.
[USCI PAPER 72-27] p0075 A73-16687
- LESCHENOK, T.**
Study of application of ERTS-A imagery to
fracture-related mine safety hazards in the coal
mining industry
[E73-10970] p0111 N73-30311
- LESPIGNASSE, B.**
Direct conversion of thermal energy to electric
energy - Thermoelectric conversion p0119 A68-11240
- LESSMANN, R. C.**
An analysis and design study of the compressible,
traveling wave, magnetohydrodynamic, induction
generator p0241 N71-26449
- LEVINE, L. S.**
Pulsed power - A new technology for controlled
thermonuclear fusion. p0181 A72-36332
- LEVY, I. M.**
A radioisotope heater for a silver-zinc battery. p0261 A68-25659
- LEWIS, A.**
Fuels for aircraft gas turbine engines p0074 A71-28754
- LEYPUNSKIY, A. I.**
Nuclear energy installations and their technical
possibilities
[JPRS-43265] p0010 N68-10725
- LICHT, L.**
Design, fabrication and testing of a foil
gas-bearing test rig
[NASA-CR-1563] p0231 N70-25623
- LIDORENKO, N. S.**
Optical characteristics of silicon photocells and
the efficiency of a thermal photoelectric
converter p0023 A68-18449
Electroquasidynamic generator p0131 A68-31227
Optical characteristics of silicon photocells and
the efficiency of a thermophotoelectric converter. p0025 A68-39356
- Electroquasidynamic generator. p0140 A69-14153
- Physical and technical problems of direct
conversion of chemical energy into electrical
[AD-696497] p0229 N70-18341
- Thermodynamic aspects of the problem of immediate
conversion of chemical energy into electrical
[AD-713875] p0240 N71-16314
- Contemporary status of studies on direct
conversion of solar energy to electrical energy
[AD-747293] p0065 N73-11050
- Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- LIEBHAFSKY, H. A.**
Fuel Cells and Fuel Batteries- A Guide to their
Research and Development. p0139 A68-44312
Fuel cells with molten-carbonate electrolytes
[REPT.-67-C-21^] p0201 N68-21439
- LIELPETER, YA. YA.**
Electromagnetic calculation of an approximate
model of an induction MHD machine with allowance
for a secondary circuit p0138 A68-29186
- LINDEKEN, C. L.**
Radon daughter equilibrium measurements in
uranium-mine atmospheres p0088 N70-14317
- LINDHAYER, J.**
Theoretical and practical fill factors in solar
cells. p0039 A72-30264
An improved silicon solar cell - The violet cell.
p0040 A73-14212
- LING, H.**
Second generation gas turbine engines. Discussion
of turbofan engines
[AD-683118] p0220 N69-26520
- LING, K. S.**
How mechanical requirements affect silicon
solar-cell costs p0033 A70-41008
Feasibility of low cost silicon solar cells.
p0041 A73-14251
- LINK, E.**
Silicon solar cell technology of the seventies
p0034 A71-16103
Some innovations in silicon solar cell technology.
p0038 A72-28029
Contribution to silicon solar cell technology.
p0039 A72-37780
- LINVILLE, B.**
Review of Bureau of Mines energy program, 1970
[BM-IC-8526] p0096 N71-36393
Bureau of Mines energy program, 1971
[BM-IC-8551] p0101 N72-31123
Bureau of Mines energy program, 1972
[BM-IC-8612] p0111 N73-30335
- LION, P. E.**
Aerospace systems and mission analysis research -
Solar electric space mission analysis final
report
[NASA-CR-106089] p0055 N69-38783
- LITCHFIELD, E. L.**
Initiation of spherical detonation in
acetylene-oxygen mixtures
[BM-RI-7061] p0116 N69-12434
- LITTLE, D. G.**
Applicability of NASA contract quality management
and failure mode effect analysis procedures to
the USGS Outer Continental Shelf oil and gas
lease management program
[NASA-TM-X-2567] p0100 N72-20055
- LIUBIMOV, G. A.**
Experimental investigation of the performance of a
porous electrode in an MHD converter during the
injection of argon with potassium addition
p0190 A73-39619
- LIVELPETER, YA. YA.**
Motion of conducting bodies in a magnetic field
[NASA-TT-F-460] p0194 N68-16286
State of the theory of magnetohydrodynamic
induction machines with working media of liquid
metal p0194 N68-16287

- On the applicability of electrodynamic approximation in the theory of liquid metal MHD energy converters
[SM-74/240] p0213 N69-13348
- LOBO, W. E.
Acetylene and low-cost power p0117 N70-14509
- LODWIG, E.
Design and performance of a mobile waste heat organic Rankine cycle system providing electric power and environmental control. p0162 A69-42267
Performance of a 35 hp organic Rankine cycle exhaust gas heat powered system
[SAE PAPER 700160] p0165 A70-25371
- LOESCH, H. E.
Solar cell development in the Federal Republic of Germany. p0037 A72-28003
- LOPERSKI, J. J.
Principles of photovoltaic solar energy conversion. p0044 A73-29591
Photovoltaic solar energy conversion p0058 N70-30228
Performance of actual solar cells p0058 N70-30229
An introduction to the physics of solar cells p0064 N72-27057
- LOFFEBDA, J. A.
Performance models for the MHW converter. p0189 A73-38422
- LOFTIN, L. K., JR.
Toward a second-generation supersonic transport. [AIAA PAPER 73-15] p0009 A73-17608
- LONDON, A. L.
Pollutants from methane fueled gas turbine combustion. [ASME PAPER 72-WA/GT-3] p0075 A73-15867
- LOPATSKII, G. S.
Electrophysical and radiative properties of a nonequilibrium argon-potassium plasma as a possible working fluid for an MHD generator p0143 A69-23441
- LORD, W. T.
Fabrication and preliminary testing of a 3kW hydrogen resistor. [AIAA PAPER 72-449] p0115 A72-26186
Hydrogen resistors for primary propulsion of communications satellites. p0009 A73-15741
- LORELL, K. E.
High temperature lens construction Patent [NASA-CASE-XNP-04111] p0060 N71-15622
- LORENTZEN, R.
Performance models for the MHW converter. p0189 A73-38422
- LORENZ, R.
Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements [EUR-4243.F] p0085 N69-31119
- LOBETSYAN, ZR. H.
Investigation of the thermal stability of the microsurface of astronomical mirrors fabricated from AM61 alloy with chromium and nickel coatings [NASA-TT-F-11659] p0048 N68-22401
- LOSIKOV, B. V.
Petroleum products, properties, quality, application, part 1 p0092 N70-23046
[AD-698442]
Petroleum products, properties, quality, application, part 2 p0092 N70-23047
[AD-698546]
Petroleum products, properties, quality, application, part 3 p0092 N70-23048
[AD-698547]
Petroleum products, properties, quality, application, part 4 p0092 N70-23049
[AD-698548]
- LOSKA, L.
On the feasibility of the determination of water, salt and sulphur in crude oil by means of neutron activation analysis p0089 N70-15280
- LOTBOP, J. W.
Experimental research on a 400 kW high power density MHD generator [AD-725739] p0245 N72-11065
- LOTT, D. E.
Thermal Heliotrope - A passive sun-tracker p0033 A70-34131
Configuration survey of lightweight solar array power systems for future missions. p0043 A73-22782
- LOTTIS, A. L.
Comparative evaluation of sol-gel fuel fabrication costs [ORNL-TM-1979] p0078 N68-12553
- LOUIS, J. F.
High Hall coefficient experiments in a large disc generator. p0144 A69-23473
Research on inert gas MHD energy conversion Final report [AD-694529] p0228 N70-15650
Research on MHD energy conversion Final report [AD-720257] p0241 N71-26190
- LOW, C. A., JR.
High voltage generation with a beta electrogenerator cell [NASA-TM-X-52776] p0232 N70-26116
- LOBARSKY, B.
Summary of conference p0012 N69-12586
- LUCAS, E. J.
Development of pulsed high energy inductive energy storage systems, volume 1 [AD-755359] p0267 N73-23014
Development of pulsed high energy inductive energy storage systems. Volume 3: Weight optimization for energy storage, coil, cryogen and dewar [AD-755360] p0267 N73-26054
- LUCAS, E.
Technological improvement in the fabrication of cast uranium carbide rods Final report [EUR-4273.D] p0086 N69-34967
- LUCIUS, J. L.
ROD - A nuclear and fuel cycle analysis code for circulating fuel reactors [ORNL-TM-3359] p0098 N72-17737
- LOGININ, N. YE.
Gasification of coal enrichment wastes p0116 N70-10884
- LUKENS, H. R.
Development of nuclear analytical techniques for oil slick identification, phase 1 [GA-9889] p0094 N71-15083
- LUKSA, W. C.
Evaluation testing of a closed Brayton-cycle electrical-power-conversion system. p0185 A73-25983
- LUPAS, N.
Physical phenomena in magnetohydrodynamic generators p0163 A70-14716
- LYNCH, J. J.
Thermionic reactor program - An overview. p0184 A73-22815

M

- MACDONALD, J. E.
Electrode-size effects in an MHD generator with nonuniform electrical conduction. p0129 A68-27110
- MACKEY, J. S.
Laser energy transfer - An analytic survey of high power applications. p0257 A73-22822
- MACKENZIE, C. E.
Electric power for space satellites p0174 A71-34227
- MACLEOD, W. E.
Digital analysis of Potomac River Basin ERTS imagery: Sedimentation levels at the Potomac-Anacostia confluence and strip mining in Allegany County, Maryland [PAEPER-E13] p0110 N73-28277
- MACOSKO, R. P.
Isotope Brayton electric power system for the 500 to 2500 watt range. p0184 A73-22793
A SNAP-8 breadboard system. Operating experience. [NASA-TM-X-61161] p0264 N68-33238
- MACPHERSON, A. C.
Microwave power rectification with commercial Schottky barrier diodes p0164 A70-21274

- MAHEPKY, E. T., JR.
Radioisotope power subsystems for space application.
p0119 A68-10231
The Solar Collector Thermal Power System - Its
potential and development status.
p0043 A73-22792
- MAKINO, M.
Optimization theory of Hall MHD generator duct
p0172 A71-23441
- MAKSIMOV, A. M.
Pulse MHD generator with a superconducting
magnetic system
p0120 A68-16523
A pulsed magnetohydrodynamic generator with a
superconducting magnetic system.
p0131 A68-30774
- MALEVSKII, I. U. N.
Power characteristics of a solar thermoelectric
generator.
p0030 A70-10752
Cascaded thermoelements and methods of their design.
p0162 A70-10754
Feasible energy and technical characteristics of
solar thermoelectric generator /STEG/ with
two-stage converter
p0032 A70-32425
Performance reliability calculation for a solar
thermoelectric generator module
p0036 A71-31672
- MALEVSKII, Y. N.
Performance reliability calculation for a modular
solar thermoelectric generator
[AD-757087]
p0067 N73-23015
- MAKHOV, M. M.
Pulsed model of a magnetohydrodynamic generator
having a strongly nonequilibrium plasma
p0174 A71-35273
- MALIUTA, D. D.
Qualitative analysis of MHD energy conversion
efficiency
p0186 A73-27321
- MALIUTA, D. D.
Influence of boundary layers on the electrical
characteristics of MHD generators
[AD-745285]
p0249 N72-33063
- MAWDEL, H.
Resources of primary energy
[A/CONF-49/P/359]
p0098 N72-16981
- MAVIN, A.
The use of thin film solar cells in the
radiovoltaic generators.
p0038 A72-28021
Prospects for radiovoltaic energy conversion
p0185 A73-23278
- MAW, D. W.
A study of advanced solar array design Quarterly
report, 1 Aug. - 31 Oct. 1969
[ESRO-CR-12]
p0058 N70-30140
- MAWOWITZ, B.
Pollution-free hybrid fossil-nuclear fueled MHD
power cycle
[BNL-12319]
p0202 N68-26381
Hybrid fossil-nuclear fueled MHD power cycles
[BNL-12569]
p0082 N69-11230
- MASON, S. V.
A review of the alkali metal Rankine technology
program.
p0139 A68-45718
- MATELL, C. L.
Batteries and energy systems
p0262 A70-42454
- MATENIERS, M. A.
Analytical and experimental studies of MHD
generator cathodes emitting in "spot" mode
[ASME PAPER 69-WA/HT-51]
p0163 A70-14797
Analytical and experimental studies of MHD
generator cathodes emitting in a "spot" mode
[NASA-TN-D-5414]
p0224 N69-35732
- MARCHENKO, A. I.
Heterogeneous solar cells based on polycrystalline
cadmium sulfide and selenide
p0033 A70-36238
Longwave sensitivity of nCdS-pCu/2-x/S solar
converters
p0034 A71-11896
Some properties of photoconverters based on
compressed sintered tablets /CST/ of CdS
p0036 A71-44390
- Heterogeneous solar converters based on
polycrystalline cadmium sulfide and cadmium
selenide
[AN-756594]
p0067 N73-21960
- MARCHIONNA, N. E.
Performance gains by using heated natural-gas fuel
in an annular turbojet combustor
[NASA-TN-X-2742]
p0105 N73-18960
- MARFAING, Y.
Advances in graded gap solar cell research.
p0040 A73-14207
- MARK, H.
Lewis Research Center earth resources program
p0101 N72-29317
- MARKAR'IAN, B. N.
Thermodynamics of systems directly converting
chemical energy into electric energy
p0180 A72-32994
- MARKEE, E. H., JR.
Relative dose factors from long-period point
source emissions of atmospheric pollutants
p0011 A68-38380
- MAROVSKII, F. T.
A method for determining the economic
effectiveness of gas turbine unit systems with
the consideration of optimum parameters
[AD-683130]
p0013 N69-26227
- MARTIN, J. F.
Current distribution of a segmented Hall generator
[AD-705160]
p0234 N70-32778
- MARTIN, K. B.
Study of application of EPTS-A imagery to
fracture-related mine safety hazards in the coal
mining industry
[E73-11034]
p0112 N73-31338
- MARTINEZ, K.
Technology of large /1 kw to 5 kw/ solar arrays.
p0025 A68-38889
- MARTINSON, L. K.
Magnetohydrodynamic coupling using a liquid metal
flywheel.
p0123 A68-20359
- MARY, S. H.
A kilowatt rotary power transformer.
p0178 A72-21414
- MASLENNIKOV, M. M.
Investigation of an MHD-generator model with an
argon-potassium plasma
p0141 A69-17999
Experimental study of an MHD generator model with
a nonequilibrium plasma
p0145 A69-23480
An experimental investigation of the electrical
conductivity of plasma in an MHD generator model
[SM-74/236]
p0213 N69-13346
International Symposium on Magnetohydrodynamic
Electrical Power Generation
[AD-703158]
p0236 N70-36409
Study of a model of an MHD generator using an
argon potassium plasma
[AD-728591]
p0246 N72-13698
- MASON, J. L.
Working gas selection for the closed Brayton cycle
p0196 A68-17802
- MASSEE, P.
MHD power conversion employing liquid metals
[TH-69-E-06]
p0222 N69-31249
- MATHEE, R. F.
Nuclear reactor space power conversion systems
[NASA-TN-X-52472]
p0204 N68-29921
- MATHUR, R. S.
Investigation on silicon p-n junction for solar
energy conversion.
p0024 A68-31623
- MATINEK, F.
Heat-transfer processes in solar energy storage
systems for orbital applications
p0033 A70-41952
- MATSEN, J. M.
Chemically regenerative, fuel cell systems.
p0129 A68-27656
- MATTEO, D. N.
Feasibility study 30 watts per pound roll-up solar
array Final report
[NASA-CR-96230]
p0051 N68-32561
- MATTES, S.
Silicon solar cell technology of the seventies
p0034 A71-16103

- Some innovations in silicon solar cell technology.
p0038 A72-28029
- Contribution to silicon solar cell technology.
p0039 A72-37780
- High efficiency Cu₂S-CdS-solar cells with improved thermal stability.
p0041 A73-14216
- MATVEEV, V. M.**
A universal power characteristic of a high-temperature solar heat source
p0039 A72-35516
- Analysis of the parameters of solar-heat power sources with energy storage units
p0045 A73-34283
- MAURO, F. DI.**
Solar generator for ELDO P/S
[REPT-RT-68/719]
p0057 A70-17439
- MAWATARI, K.**
An experimental study on water-cooled metal electrodes of MHD generator.
p0127 A68-23925
- MAXWELL, C. D.**
Progress in analytical modeling of MHD power generators.
[AD-741173]
p0179 A72-29355
- MAXWELL, J. B.**
The isolation of a series of acyclic isoprenoid alcohols from an ancient sediment - Approaches to a study of the diagenesis and maturation of phytol.
p0076 A73-25465
- MAYER, M. S.**
Optimization of the quasi-vacuum mode thermionic converter
p0172 A71-25899
- MC AFEE, F. W.**
Large area solar array Quarterly report - Phase 2, 1 Mar. - 31 May 1968
[NASA-CR-95999]
p0051 A68-31404
- MC CARTHY, E. D.**
Treatise in organic geochemistry
[NASA-CR-93111]
p0079 A68-17316
- MC CUTCHEON, M. J.**
Magnetohydrodynamic studies in cylindrical systems with power generation applications
p0204 A68-29990
- Energy transfer problems in superconductors and flowing plasmas Final report
[UAPL-31]
p0207 A68-37342
- MC LAREN, W. H.**
High-temperature reactor
[TRG-1996]
p0093 A70-37284
- MC NAB, I. B.**
A non-equilibrium electron mode for kilowatt range MPD space power
p0197 A68-17812
- MCCARTY, L. H.**
Candidate electrical power systems for Space Station
[AIAA PAPER 71-825]
p0174 A71-34720
- MCCOWN, F. P.**
An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-10646]
p0108 A73-25342
- MCCREA, D. B.**
The remote sensing of air pollution from coal utilization
p0101 A72-29363
- MCCUTCHEON, M. J.**
An analysis of the annular induction MHD generator.
p0139 A68-43072
- MCDANAL, A. J.**
The development of a residential heating and cooling system using NASA derived technology
[NASA-CR-124063]
p0066 A73-17911
- MCGEE, J. B.**
Evaluation testing of a closed Brayton-cycle electrical-power-conversion system.
p0185 A73-25983
- MCHENBY, R. E.**
Cn-244: A radioisotopic power fuel
[CONF-720519-11]
p0103 A73-12717
- MCKEE, H. B.**
Electrostatic probe measurements in flowing NaK-seeded argon.
p0132 A68-37310
- MCKENNA, J. A.**
Rotary wind economics in a time of changing social values.
p0076 A73-33185
- MCKIERMAN, J.**
Thermoelectric devices - For space and remote terrestrial sites
p0167 A70-39225
- MCKIERMAN, T. F.**
Pulsed power fuel cells
p0166 A70-27758
- MCKINNEY, C. H.**
Bureau of Mines - API survey of aviation gasoline, 1969
[SAE PAPER 700228]
p0073 A70-25897
- MCLEAN, A. F.**
Ceramics in automotive gas turbines.
p0187 A73-31250
- MCHURTRY, G. J.**
Mapping of anthracite refuse
[E73-11107]
p0112 A73-33264
- Acid mine drainage and strip mines
[E73-11112]
p0112 A73-33269
- MCNAB, I. B.**
Closed-cycle MPD experiments with applied electric and magnetic fields.
p0145 A69-23479
- MCRAE, G. M.**
Refanned commercial gas turbine engines.
[SAE PAPER 730346]
p0187 A73-34694
- MEASURES, E. M.**
The development of an airborne remote laser fluorosensor for use in oil pollution detection and hydrologic studies
[OTIAS-175]
p0099 A72-20479
- MEDIN, S. A.**
Analysis of a power source employing an MHD generator and a thermocompressor
p0142 A69-21592
- MEERS, D. C.**
Microwave radiometric detection of oil slicks
[AD-728551]
p0098 A72-14402
- MEIER, P. G.**
Replenishment of electrodes for MHD power generation
p0166 A70-30535
- MEINEL, A. B.**
Thermal performance of a linear solar collector.
[ASME PAPER 72-WA/SOL-7]
p0042 A73-15802
- MEINEL, M. P.**
Thermal performance of a linear solar collector.
[ASME PAPER 72-WA/SOL-7]
p0042 A73-15802
- MELENTYEV, L.**
The future development of energetics
[M-7428]
p0011 A68-35752
- MELKUNOV, L. G.**
Problems of increasing the reliability of automatic mining equipment
[NASA-TN-X-61123]
p0081 A68-25716
- MENKE, H. H.**
Optical and technological problems of solar cell generators
p0050 A68-28745
- MERRIFIELD, P. M.**
Geologic information from space photography
p0088 A70-14088
- MERRILL, E. T.**
Factors affecting the optimum fuel cycle
[BNWL-SA-3605]
p0094 A71-21050
- MERTEN, B.**
Water-suspended coal supply to thermal power plants
p0092 A70-29067
- MERTEN, K. P.**
Feasibility study of a 30 watts per pound roll up solar array Quarterly technical report, 1 Jan. - 31 Mar. 1968
[NASA-CR-94243]
p0048 A68-21879
- Nimbus 2 - Photovoltaic power systems on flight spacecraft
[NASA-CR-62045]
p0202 A68-24455
- MESSERLE, H. K.**
Energy conversion statics
p0166 A70-27670
- Energy conversion dynamics.
p0183 A73-20396
- MESIETS, I. A.**
Prospects for thermal water exploration in Transcarpathian region of Ukrainian SSR
p0090 A70-16586
- METZGER, C. A.**
Application of radioisotopes for aerospace waste reclamation and water systems
[AMRL-TR-67-158]
p0080 A68-21041

- MEYER, A. P.
A 1.5 kw fuel cell powerplant
[AD-730796] p0246 N72-14246
- MICHALEK, R.
Open cycle fuel cell power plant direct currents,
1.5 KW
[AD-764285] p0254 N73-30979
- MIDDLETON, A. E.
Effects of positive ion implantation into
antireflection coating of silicon solar cells
[NASA-CR-131090] p0066 N73-19059
- MIDYETT, C. L.
Air Force Advanced Solar Turbo Electric Concept.
p0023 A68-20595
- MIKELSON, YU. YA.
Higher spatial harmonics of the magnetic field of
an induction MHD machine
p0194 N68-16289
- MIKHAILOV, YU. M.
Liquid-metal magnetohydrodynamic generators at
large magnetic Reynolds numbers.
p0123 A68-20403
- MILES, E. W.
Technology of large /1 kw to 5 kw/ solar arrays.
p0025 A68-38889
- MILEWSKI, J.
Effect of the magnetic Reynolds number in the
induction striated-flow MHD generator.
p0120 A68-15423
Preliminary experiments on the striated-flow
induction synchronous MHD generator.
p0128 A68-23931
Experiments on a striated-flow induction
synchronous MHD generator.
p0145 A69-23487
- MILLER, A. J.
Space heating in urban environments
p0227 N70-14518
- MILLER, J. V.
Nuclear reactor heat sources for future power
generation
p0012 N69-12576
- MILLER, N. C.
Further development of the STAR thermoelectric
panel.
p0162 A69-42261
- MILLER, P. R.
Electrical power systems for space - Achievements
and issues
p0174 A71-37122
High-power, long-life electrical generating
systems for lunar base missions
p0237 N70-39278
- MILLER, R. W.
Subassembly test program outline for FY 1969 and
1970
[IN-1313] p0088 N70-13396
- MILLER, T. J.
Experimental performance of a 2-15 kilowatt
Brayton power system in the Space Power Facility
using krypton
[NASA-TM-X-52750] p0229 N70-19190
- MILLONSHCHIKOV, N. D.
Plasma physics and problems of
magnetohydrodynamics in the transformation of
energy
[AD-699661] p0231 N70-25577
- MILLS, E. G.
A cursory look at Tokamak fusion reactors
[MATT-659] p0218 N69-23954
- MILLS, W. R.
Advances in nuclear geophysical methods in oil
geology and rock analysis
[SM-112/25] p0085 N69-30800
- MILNES, A. G.
Heterojunction solar cell calculations
p0033 A70-40623
Heterojunction solar cell calculations
[NASA-CR-49827] p0056 N70-12119
- MINARDI, J. E.
Some analytical treatments of EPD processes
p0216 N69-18445
- MISHIMA, Y.
Nuclear fuel and materials /U, Be, Zr/ for reactor
[LIB/TRANS-240] p0093 N70-33032
- MITCHELL, J. T. D.
Economic generation of power from thermonuclear
fusion
[CLM-R-85] p0262 N68-25016
- MITCHNER, M.
Electrode-size effects in an MHD generator with
nonuniform electrical conduction.
p0129 A68-27110
Electrostatic probe measurements in flowing
NaK-seeded argon.
p0132 A69-37310
Engineering aspects of magnetohydrodynamics;
Proceedings of the Thirteenth Symposium,
Stanford University, Stanford, Calif., March
26-28, 1973.
p0189 A73-38310
Boundary phenomena in MHD generators Summary
report, 15 Feb. 1966 - 15 Feb. 1968
[AFOSR-68-0859] p0202 N68-26537
Electrode temperature effect on MHD generator
performance
[AD-683793] p0220 N69-27071
- MIYOSHI, Y.
Investigation of plasma expansion in a uniform
field and shock formation due to a magnetic
barrier.
p0134 A68-41790
- MOCKOVCIK, J., JR.
A systems engineering overview of the satellite
power station.
p0043 A73-22914
- MOHNS, G.
Solar generators and solar cells
p0032 A70-29554
- MOHR, P. B.
Controlled thermonuclear power
[UCRL-71520] p0226 N70-12638
Some economic aspects of power conversion for
fusion reactors
[UCRL-72349] p0239 N71-15242
- MOIR, R. W.
Experimental and computational investigations of
the direct conversion of plasma energy to
electricity
[CONF-710607-126] p0244 N71-38463
- MORRIS, S. A.
Peculiarities of magnetohydrodynamic converters
employing the Rankine cycle
p0131 A68-31228
Special characteristics of installations with
magnetohydrodynamic converters working on the
Rankine cycle.
p0140 A69-10154
- MOLNAR, D.
Factors effecting the performance of diagonal
conducting wall open cycle MHD generators
[AD-721455] p0242 N71-28718
- MOLNAR, P.
Anion-exchange behavior of light rare earths in
aqueous methanol solutions containing neutral
nitrates. 2 - Macro-micro separations
[ANL-TRANS-518] p0192 N68-12691
- MONFIE, C. F.
Energy required for proton production by electron
impact in mixtures of atomic and molecular
hydrogen
[NASA-TM-X-52344] p0116 N68-24657
- MONTELLANICO, P.
Pyrometallurgical concentration of enriched
uranium in irradiated MTR fuel elements
[EUR-4243.F] p0085 N69-31119
- MONTI, R.
Generalized Saha equation for non-equilibrium two
temperature plasmas
p0197 N68-17813
- MOORE, D. D.
A brief overview of the energy requirements of the
Department of Defense
[AD-754824] p0106 N73-20819
- MOORE, G. L.
A theoretical investigation and experimental
verification of the two-phase heat transfer
characteristics of a combined solar
collector-generator for a solar air conditioner
p0053 N69-17227
- MOORE, K.
New developments in degradation-resistant CdS
solar cells
p0033 A70-43537
Integrated high voltage cadmium sulphide solar
batteries
p0034 A71-16058

- MOORE, W. E.**
The effect of fuel price increases on energy intensiveness of freight transport
[R-804-NSF] p0258 N72-23979
Growth rates within the transportation sector
[P-4935] p0021 N73-23962
Transportation and energy
[P-5025] p0113 N73-33921
- MORDCHELLENS-BEGNIER, G.**
Influence of thermal and electric contact resistances on the output of thermoelectric-conversion generators
p0147 A69-26364
- MORGAN, D. R.**
The potential of magnetohydrodynamic power sources for airborne applications
p0167 A70-33474
- MORGAN, J. L.**
Design and preliminary operation of the Lewis magnetohydrodynamic generator facility
[NASA-TN-D-4867] p0207 N68-37259
- MORGENTHAUER, G. F.**
Composite flywheel stress analysis and materials study.
p0261 A68-12853
- MORI, Y.**
A shock tube study of nonequilibrium MHD power generation.
p0140 A69-12425
- MOROZOV, A. E.**
Thermodynamic analysis of new liquid-metal MHD-generator cycles
p0148 A69-27489
- MORNA, F.**
Possibilities and problems of gas turbine application for ground motion machines
[PUBL-18] p0227 N70-13927
- MORRILL, C. C.**
Fuel cells for improved electrical power supply.
[AIAA PAPER 73-82] p0183 A73-17641
- MORRIS, J. P.**
The diaminode: A research and development tool for nuclear thermionics
[NASA-TN-X-2586] p0248 N72-28685
- MORRIS, R. E.**
High pressure ratio centrifugal compressors for small gas turbine engines
p0172 A71-24218
- MORROW, B. B.**
Multihundred watt radioisotope thermoelectric generator /MHV-RTG/
p0176 A71-38927
- MORSE, F. H.**
Survey of liquid metal magnetohydrodynamic energy conversion cycles
p0167 A70-39325
Terrestrial adaptation of the thermal heliotrope.
[ASME PAPER 71-WA/SOL-10] p0037 A72-15893
Passive solar array orientation devices for terrestrial application.
p0043 A73-22440
Review of liquid-metal magnetohydrodynamic energy conversion cycles
[NASA-TN-X-63671] p0224 N69-37703
Response characteristics of a thermal-heliostate solar-array orientation device
p0063 N72-13396
An assessment of solar energy as a national energy resource
[NASA-CR-133101] p0068 N73-26818
- MOSELEY, J. D.**
Static bed reactor for studies of a plutonium hexafluoride volatility process
[RFP-1048] p0080 N68-19265
- MOSIER, J. R.**
Decontamination of petroleum products Patent
[NASA-CASE-1NP-23835] p0095 N71-23499
- MOSKOWITZ, S.**
Design and test evaluation of a liquid metal regenerator for gas turbines.
[ASME PAPER 72-GT-33] p0178 A72-25629
- MOSKOVITIN, A. I.**
Status and perspectives of developing magnetohydrodynamic generators
[FTD-HT-66-378] p0192 N68-13694
- MOSS, T. A.**
Study of a 300-kilowatt Rankine-cycle advanced nuclear-electric space-power system
[NASA-TN-X-1919] p0226 N70-11975
- MOSS, T. S.**
Calculated efficiencies of practical GaAs and Si solar cells including the effect of built-in electric fields
p0032 A70-21721
- MOSTINSKII, I. L.**
Reduction of temperature in an open-cycle MHD power plant owing to injected additives.
p0140 A69-14162
- MOTULEVICH, V. P.**
The ENIN-2 experimental open cycle MHD generator rig
[AD-751251] p0251 N73-16036
- MOUNT, J. W.**
Solar charger kit experimental
[AD-734809] p0063 N72-19066
- MROCHER, J. E.**
The economics of hydrogen and oxygen production by water electrolysis and competitive processes
p0117 N70-14511
- MUCHNIK, G. F.**
Electroquasdynamic generator
p0131 A68-31227
Electroquasdynamic generator.
p0140 A69-14153
Investigations of high-temperature solar energy absorbers and thermal storage devices.
p0030 A70-10764
- MUEHLHAUSER, J.**
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
Factors effecting the performance of diagonal conducting wall open cycle MHD generators
[AD-721455] p0242 N71-28718
- MUEHLHAUSER, J. W.**
The performance of a family of diagonal conducting wall MHD open cycle generators
p0169 A70-40004
The performance of a family of diagonal conducting wall MHD open cycle generators
[AD-705159] p0235 N70-32986
- MUELLER, E.**
New methods for the fabrication of solar arrays
p0031 A70-12080
Development of advanced solar cell modulus technology for use by solar probes and large area solar cell arrays
[RP-93-0] p0048 N68-22010
Solar cells and their application to space traveling
[RP-89-0] p0052 N69-11991
- MUELLER, R. P.**
Energy in the environment and the second law of thermodynamics
[NASA-TN-X-65912] p0019 N72-26971
Energy conservation alternatives to nuclear power, a case study
[NASA-TN-X-70468] p0022 N73-31990
- MURPHY, T. A.**
Biological effects of oil pollution - Bibliography. A collection of references concerning the effects of oil on biological systems
[PB-188206] p0014 N70-21569
- MURRAY, E. M.**
Fluctuations in series connected open cycle MHD generators
[AD-721454] p0242 N71-28680
- MURRAY, R. W.**
Application of radioisotopes for aerospace waste reclamation and water systems
[AMRL-TR-67-158] p0080 N68-21041
- MURTHY, S. N.**
Effect of heterogeneity and Hall current on the MHD power generator.
p0182 A73-10434
- MYERS, B.**
Controlled thermonuclear power
[UCRL-71500] p0226 N70-12638
- MYSHKIN, L. P.**
Prospects for thermal water exploration in Transcarpathian region of Ukrainian SSR
p0090 N70-16586
- MYTTON, R. J.**
New developments in degradation-resistant Cds solar cells
p0033 A70-43537
Integrated high voltage cadmium sulphide solar batteries
p0034 A71-16058

N

- WAGEL, A. L.**
Key technology for airbreathing hypersonic aircraft.
[AIAA PAPER 73-58] pC009 A73-17631
- WAGEY, T. F.**
Combustion and propulsion
[AGARDGRAPH-81] pC195 N68-17793
- WAGLEV, A. M.**
New absorbents and classification of methods of removing sulphur dioxide from industrial gases
[NRL-RTS-5464] pC091 N70-20779
- WAGY, L. A.**
Design and preliminary operation of the Lewis magnetohydrodynamic generator facility
[NASA-TN-D-4867] pC207 N68-37259
- WAKAMURA, Y.**
Development of oxide system fuels
[NLL-DOURRE-TRANS-419-/9091.9F/1] pC091 N70-21080
- WAPOLITANO, L. G.**
Generalized Saha equation for non-equilibrium two temperature plasmas
pC197 N68-17813
- WARDI, G.**
Low emission fuels and devices for aviation engines
pC097 N72-11675
- WARIJES, L.**
Optimization methods for jet-propulsion with respect to exergy
pC008 A71-21300
- WARHA, S.**
Heat transfer from radioisotopic power sources in porous media
[AD-691213] pC225 N69-40031
- WATH, G.**
A new stable high power giant-pulse laser at 0.53 μ using LiIO sub 3
pC163 A70-16470
- WAUROV, A. M.**
Some problems related to the conversion of chemical energy into mechanical work
pC171 A71-16785
Some aspects of the conversion of chemical energy to mechanical work
pC174 A71-33037
- WAZAROV, E. V.**
Selection of optimum conditions at the inlet of an MHD-generator channel
pC172 A71-22136
Analysis of optimal conditions for energy conversion in an MHD-generator channel
pC182 A73-16586
- WEDOSPISOV, A. V.**
Cesium-doped mercury as a working fluid for studying the specific features of MHD generators based on a Rankine cycle
pC143 A69-23459
Pulsed model of a magnetohydrodynamic generator having a strongly nonequilibrium plasma
pC174 A71-35273
Parameters of magnetohydrodynamic /MHD-/generators taking into account ionization instability of plasma
[FTD-MT-24-205-67] pC206 N68-35442
Hq and Cs as working media for studies of certain properties of MHD generators working in a Rankine cycle
[SM-107/130] pC214 N69-15430
- WEGORO, A.**
Research on radioactive dust in the air at KUR operation
[KURRI-TR-56] pC091 N70-21010
- WEGRESKUL, V. V.**
Solar elements based on heterojunctions of p-type GaAs/1-x/P/x/ and n-type GaAs
pC039 A72-30225
- WELSON, R. L.**
Large superconducting baseball magnet, part 1
[UCRL-71010] pC218 N69-22640
- NEWBY, G. A.**
United States Space Nuclear Electric Power Program.
pC181 A72-45179
- NGUYEN, D. T.**
Technological improvements on CdS solar cells.
pC038 A72-28016
- NICHOLS, L. D.**
Analytical and experimental studies of MHD generator cathodes emitting in "spot" mode
[ASME PAPER 69-WA/HT-51] pC163 A70-14797
Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator
pC165 A70-25614
Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator
pC169 A70-40011
Status of power generation experiments in the NASA Lewis closed-cycle MHD facility.
[AIAA PAPER 72-103] pC177 A72-16936
Hall current effects in the Lewis magnetohydrodynamic generator.
pC184 A73-22823
Criteria for use of Rankine-MHD systems in space
[NASA-TN-X-52191] pC200 N68-19019
Design and preliminary operation of the Lewis magnetohydrodynamic generator facility
[NASA-TN-D-4867] pC207 N68-37259
Comparison of Brayton and Rankine cycle magnetohydrodynamic space-power generation systems
[NASA-TN-D-5085] pC217 N69-20852
Analytical and experimental studies of MHD generator cathodes emitting in a "spot" mode
[NASA-TN-D-5414] pC224 N69-35732
Effect of electrothermal instabilities on Brayton- and Rankine-cycle magnetohydrodynamic space-power generation systems
[NASA-TN-D-5461] pC224 N69-37883
Closed-cycle magnetohydrodynamic power generation
pC229 N70-18728
The potential of nuclear MHD electric power systems
[NASA-TN-X-67829] pC241 N71-24578
Combined turbine-magnetohydrodynamic Brayton cycle power system for space and ground use
[NASA-TN-D-6513] pC244 N71-36450
Status of power generation experiments in the NASA Lewis closed cycle MHD facility
[NASA-TN-X-67975] pC246 N72-12166
- WICOLAIDE, A.**
Research in magnetohydrodynamics summarized
pC232 N70-28078
- WIEKISCH, E. A.**
Energy conversion in magnetohydrodynamic /MHD/ generators /Energie wandlung mit magnetohydrodynamischen /MHD-/ Generatoren/.
pC121 A69-17797
- WIGGENHANN, E. E.**
Organic Rankine cycle technology program Quarterly progress report, 1 Jul. 1969 - 1 Jan. 1970
[SAN-651-118] pC237 N70-37652
- WIMMO, R.**
Construction and test of an MHD generator channel and electrical power converter
[AD-758783] pC253 N73-25106
- WISHIOKA, K.**
Laser energy transfer - An analytic survey of high power applications.
pC257 A73-22822
- WIXON, A. C.**
Endothermic fuels for hypersonic vehicles.
[AIAA PAPER 68-997] pC072 A68-45023
Endothermic fuels for hypersonic vehicles
[AIAA PAPER 68-997] pC073 A71-24852
- WOACK, G.**
Applied magnetohydrodynamics. Number 5 - MHD-nuclear power stations
[JUL-689-TP] pC242 N71-30458
Applied magnetohydrodynamics, report no. 10, MHD-test facility Argas 2: Description and operations
[NASA-TT-P-14876] pC252 N73-22662
Applied magnetohydrodynamics, Volume 11: Outlook and possibility for MHD gas combustion generators with air turbine for nuclear plant application in the BRD
[JUL-892-TP-VOL-11] pC254 N73-30699
- WOBLE, B. F.**
Influence of volatile fuel components on vehicle emissions
[BR-RI-7291] pC117 N70-20511
- WOEL, G. T.**
Review and evaluation of past solar cell development efforts Semiannual report, Jun. 1 - Nov. 30, 1967
[NASA-CR-92679] pC047 N68-16882

- HOSHUCHI, T.**
High temperature phase studies with a solar furnace
p0032 A70-30907
- HORGREN, C.**
Turbojet emissions - Hydrogen versus JP.
p0116 A73-37498
- MORRIS, W. T.**
End region of a single-load crossconnected M.H.D.
generator.
p0128 A68-25596
- MORSE, D. A.**
Large area solar array Quarterly report - Phase
2, 1 Mar. - 31 May 1968
[NASA-CR-95999]
p0051 A68-31404
- MORTBROOK, C. J. H., JR.**
Transit analysis
[SC-RR-69-662]
p0091 A70-21251
- MOTTINGHAM, W. E.**
Thermodynamics of thermionic energy conversion
p0196 A68-17805
- NOVGORODOV, M. A.**
Investigation of an MHD-generator model with an
argon-potassium plasma
p0141 A69-17909
Experimental study of an MHD generator model with
a nonequilibrium plasma
p0145 A69-23480
- NOVAK, K.**
Project for obtaining controlled nuclear fusion.
A new system that should lead to rapid practical
use for energy production by controlled nuclear
fusion
[WP-19152]
p0019 A73-12707
- NOVAK, W. B.**
Research in energy conversion Final report, 1
Oct. 1963 - 30 Sep. 1966
[AFCR-67-0512]
p0200 A68-21051
- NOYES, R. C.**
Review of FBR core design problem areas
p0087 A69-35240
- NYSTROM, T. L.**
Five six zero-watt portable thermoelectric power
module Final report
[AD-662770]
p0193 A68-15230
- O**
- OBENSCHAIN, A. F.**
A computer program to determine the effect of
charged-particle irradiation on solar-cell
output power
[NASA-TN-X-63559]
p0054 A69-27843
- OBTEMPERANSKII, P. V.**
Analysis of radiant transfer processes in
cylindrical cavity-type receivers of solar
installations
p0027 A69-32799
- OGIWARA, H.**
An experimental study on water-cooled metal
electrodes of MHD generator.
p0127 A68-23925
- OHAIN, E. V.**
The role of electrofluid dynamics in the field of
direct energy conversion
p0215 A69-18440
- OKAHOTO, Y.**
Investigation of plasma expansion in a uniform
field and shock formation due to a magnetic
barrier.
p0134 A68-41790
- OKHOTIN, A. S.**
Thermoelectric generators
[AD-741858]
p0248 A72-29045
- OKHOTIN, V. S.**
Thermoelectric generators
[AD-741858]
p0248 A72-29045
- OKHRENNKO, M. M.**
Optimum geometric relationships in a coaxial
linear induction and MHD generator
[AD-685523]
p0221 A69-29843
- OLDEKOP, W.**
Calculation model for Hall type electromagnetic
plasma accelerators
p0146 A69-25214
- OLDENKAMP, R. D.**
Development of a thermally regenerative
sodium-mercury galvanic system. II - Design,
construction, and testing of a thermally
regenerative sodium-mercury galvanic system.
p0129 A68-27639
- OLGAARD, P. L.**
Description of the URU-programme
[NISO-X-684]
p0082 A68-33991
- OLIN, J. G.**
Experimental studies with an arc-driven Hall MHD
generator with strong MHD interaction.
p0127 A68-23921
- OLIPHANT, T. A.**
Direct conversion of thermonuclear plasma energy
by high magnetic compression and expansion.
p0190 A73-41676
- OLIVER, D. A.**
Electrode-size effects in an MHD generator with
nonuniform electrical conduction.
p0129 A68-27110
- OLIVER, R. L.**
Solar arrays utilizing large area silicon solar
cells.
p0028 A69-35708
- OLSEN, L. C.**
Thermoelectric nuclear batteries.
p0188 A73-38410
- OLSON, L. G.**
Development of a single-grade general aviation avgas
[SAE PAPER 710369]
p0073 A71-24239
- ONALLEY, J. R.**
Regional landscape change: A case for ERTS-1
[E72-10265]
p0103 A73-12364
- ONAN, H.**
Simulated space environment tests on cadmium
sulfide solar cells
[NASA-CR-120840]
p0063 A72-14029
- ONEILL, E. J.**
The development of a residential heating and
cooling system using NASA derived technology
[NASA-CR-124063]
p0066 A73-17911
- OPJORDEN, E. W.**
Solar cell optical design considerations.
p0041 A73-14226
- ORFANOV, I. V.**
Theoretical possibility of converting the kinetic
energy of an ionized gas flow into electricity
p0185 A73-23473
- ORLOV, P. P.**
Investigation of the influence of throttling on
the efficiency of a Rankine cycle with an MHD
generator
p0134 A68-41271
Thermodynamic analysis of new liquid-metal
MHD-generator cycles
p0148 A69-27489
- ORLOV, P. V.**
Superconductors in marine technology
[AD-755711]
p0252 A73-22702
- OROVEANU, T.**
Determination of heat losses in an oil well during
the injection of a hot liquid in the stratum
p0074 A72-15743
- OSUGI, F. S.**
Mariner Mars power system optimization study
Interim report, 4 Mar. - 31 May 1968
[NASA-CR-95263]
p0050 A68-27974
- OTTO, L.**
Environmental factors in operations to combat oil
spills
[WMO-359]
p0112 A73-32300
- OUGH, P. T.**
Solar elements based on heterojunctions of p-type
GaAs/1-x/P/x/ and n-type GaAs
p0039 A72-30225
- OVCHEBENKO, V. A.**
Investigation of the influence of throttling on
the efficiency of a Rankine cycle with an MHD
generator
p0134 A68-41271

P

- PAGE, L. L.**
Active cooling of a hydrogen fueled scramjet engine.
[AIAA PAPER 68-1091]
p0072 A68-44975
Active cooling of a hydrogen-fueled scramjet engine.
[AIAA PAPER 68-1091]
p0115 A69-43725

- PAIREWOMSKY, B.**
Optimization of energy storage for solar space power.
p0261 A68-43812
Optimization of energy storage for solar space power, appendix 1
p0056 N70-16229
- PAILLHAREY, D.**
Reflections on heliothermic transformation of direct solar radiation
p0069 N73-33767
- PAKEY, I. I.**
Principles of thermoelectronic and magnetohydrodynamic conversion of energy
[AD-748707] p0250 N73-13061
- PALEEV, I. I.**
Fundamentals of thermionic and magnetohydrodynamic energy conversion
p0172 A71-26099
- PALMASON, G.**
Satellite geological and geophysical remote sensing of Iceland
[E73-10874] p0111 N73-29225
- PANCHENKO, V. P.**
Qualitative analysis of MHD energy conversion efficiency
p0186 A73-27321
Influence of boundary layers on the electrical characteristics of MHD generators
[AD-745245] p0249 N72-33063
- PANNENHANS, R.**
Deep sea radioisotope-fueled thermoelectric generator power supply system. SNAP-21 program, phase 2 - 10-watt system. Final summary report
[MMM-3691-62] p0239 N71-15039
- PAPAYLIOU, K.**
Aerodynamic problems in cooled turbine blading design for small gas turbine
p0220 N69-26532
- PAPATHAKOS, L. C.**
Use of an air-assist fuel nozzle to reduce exhaust emissions from a gas turbine combustor at simulated idle conditions
[NASA-TN-D-6404] p0096 N71-31456
- PAPE, R.**
Multimegajoule, pulsing, explosive driven MHD feasibility study
[AD-735660] p0247 N72-21497
- PARFENOV, B. V.**
Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition
p0190 A73-39619
- PARIKH, P. G.**
Pollutants from methane fueled gas turbine combustion.
[ASME PAPER 72-WA/GT-3] p0075 A73-15867
- PARKINSON, R. C.**
Hydrogen resistojets for primary propulsion of communications satellites.
p0009 A73-15741
- PARSONS, T. R.**
Frontiers of technology study. Volume 3 - Implementation
[PB-178272] p0011 N68-31690
Frontiers of technology study. Volume 2 - Survey
[PB-178271] p0011 N68-31703
- PARUCCINI, M.**
Can thorium compete with uranium? An assessment for heavy-water and graphite moderated reactors
[EUR-4264.2] p0085 N69-31081
- PASCIUTTI, E. R.**
Low-voltage conversion from primary and secondary sources.
p0138 A68-42571
- PASHCHENKO, V. P.**
Physical bases of thermionic energy conversion
p0190 A73-41876
- PASICHNYI, V. V.**
Investigation of the possibility of using radiant solar energy for welding and soldering of materials
p0040 A72-45126
- PATHA, J. T.**
Feasibility of large-scale orbital solar/thermal power generation.
p0046 A73-38404
- PATRASHEV, A. N.**
Elements of the general transient-response theory of liquid-metal conduction MHD generators
p0150 A69-27506
Elements of the general theory of transient work processes of liquid-metal MHD conduction type generators
[AD-680712] p0220 N69-26620
- PAVELETS, S. IU.**
Longwave sensitivity of nCdS-pCu/2-x/S solar converters
p0034 A71-11896
Efficiency of solar energy converters based on CdS-Cu/2 minus x/S heterojunctions
p0036 A71-42536
- PAVLENKO, V. E.**
Liquid-metal MHD systems with laminar flow and electric power generation by the synchronous principle
p0148 A69-27491
- PAVONE, D.**
Compatibility of the MHW-RTG heat source materials.
p0076 A73-38427
- PAYNE, P. A.**
Low temperature and low solar intensity characteristics of silicon solar cells
p0034 A71-16071
- PEACOCK, A. T.**
Economic analysis of the use of gelled fuels in jet transport aircraft. Final report
[FAA-NA-70-45] p0093 N70-34002
- PEER, C. R.**
Connector strips-positive, negative and T tabs
[NASA-CASE-XGS-C1395] p0053 N69-21519
- PENNY, F. W.**
A field survey of emissions from aircraft turbine engines
[BM-HI-7634] p0100 N72-25584
- PENNEWELL, J. D.**
Applicability of satellite remote sensing for monitoring surface mining activities
[E73-10731] p0108 N73-26337
Applicability of satellite remote sensing for monitoring surface mining activities
[E73-11033] p0112 N73-31337
- PEREZ, P.**
Rollup subsolar array. Volume 2 - Detailed test results. Final report
[NASA-CR-118006] p0061 N71-23714
- PERKINS, D. M.**
Recent progress of thin film solar cells.
p0024 A68-20738
- PERKINS, J. E. B.**
Small engines - Big business /1972 Halford Memorial Lecture/.
p0187 A73-34447
- PERKINS, P. J.**
Comparison of ASTM-A1 and natural gas fuels in an annular turbojet combustor
[NASA-TN-X-52700] p0087 N70-12152
- PERKINS, W. A.**
Report of the Ad Hoc Panel on fusion research on low-beta plasmas confined in open-ended geometries
[TID-24254] p0203 N68-29063
- PERLMUTTER, M.**
Device for directionally controlling electromagnetic radiation. Patent
[NASA-CASE-XLE-C1716] p0059 N70-40234
- PERZ, D. A.**
Experimental evaluation of a voltage regulator-exciter for a 15 kilovolt-ampere Brayton cycle alternator
[NASA-TN-D-4697] p0204 N68-29960
- PESCHKA, W.**
Some aspects on the optimization of an inductive MHD converter.
p0128 A68-23932
Energy conversion with the aid of the magnetocaloric and the electrocaloric effects
p0128 A68-25034
Experimental work on inductive magnetoplasma dynamic converters.
p0146 A69-23490
The optimization of MHD induction converters.
p0150 A69-27504
Power supply and power converters in satellites and spacecraft
p0177 A72-16745

- New energy systems for space flight p0183 A73-17668
- High temperature energy systems with plasma reactors and inductive magnetoplasma-dynamic converters [DLR-FB-67-59] p0191 N68-11139
- Energy conversion using magnetocaloric and electrocaloric effects [DGLR-68-005] p0201 N68-22013
- High temperature energy systems with plasma reactors and inductive magnetoplasma-dynamic converters [NASA-TT-F-11825] p0205 N68-30811
- Magnetoplasma-dynamic /MPD-/ converters [DLR-FB-69-85] p0232 N70-26208
- Magnetoplasma-dynamic /MPD/ converters [ABC-TR-7161] p0239 N71-15010
- PETERSEN, G. W.
Mapping of anthracite refuse [E73-11107] p0112 N73-33264
- Acid mine drainage and strip mines [E73-11112] p0112 N73-33269
- PETERSEN, R. H.
Hypersonic aircraft technology and applications p0115 A70-31851
- Hypersonic transports - Economics and environmental effects. p0009 A73-34435
- PETERSON, J. R.
Status of advanced Rankine power conversion technology [GESP-623] p0174 A71-33525
- PETERSON, K. R.
Diffusion measurements at medium range from a continuous point source p0012 N68-38392
- PETEU, G.
Nuclear techniques currently used in oil field exploitation [SM-112/24] p0084 N69-30799
- PETRICK, M.
Analytical and experimental studies of liquid-metal Faraday generators. p0148 A69-27485
- Direct current MHD generators with variable conductivity, velocity, and magnetic field. p0157 A69-39027
- Critique of MHD power generation [ASME PAPER 69-WA/PWR-12] p0163 A70-14754
- Symposium on the Engineering Aspects of Magnetohydrodynamics, 12th, Argonne, Ill., March 27-29, 1972, Proceedings. p0179 A72-29351
- PETRIK, E. J.
Transfer function determination of the primary loop of a conceptual nuclear Brayton space powerplant [NASA-TM-X-2193] p0240 N71-17933
- Operating characteristics of the primary flow loop of a conceptual nuclear Brayton space powerplant [NASA-TM-X-2161] p0240 N71-18866
- PETROV, V. I.
Device for investigating thermionic energy converters. p0156 A69-34700
- PETTY, S. W.
Experimental research on a 400 kW high power density MHD generator [AD-725739] p0245 N72-11065
- PETTIGREW, W. A.
Ecological effects of strip mining in Ohio [E72-10256] p0102 N73-12356
- Preliminary evaluation of the 15 October 1972 ERTS-1 imagery of east central Ohio (scene 1034-15415) p0106 N73-20413
- [E73-10454] p0106 N73-20413
- ERTS-1 investigation of ecological effects of strip mining in eastern Ohio [PAPER-E2] p0109 N73-28266
- PETZEL, G.
An evaluation of the suitability of ERTS data for the purposes of petroleum exploration [E73-10646] p0108 N73-25342
- PFABLS, O.
Technological improvement in the fabrication of cast uranium carbide rods Final report [EUR-4273.D] p0086 N69-34967
- PFISTER, H.
Photovoltaic energy conversion p0121 A68-17793
- PFISTERER, F.
Investigations of the inhomogeneity of polycrystalline Cu_x/S-CdS solar cells. p0041 A73-14222
- PIERSON, E. S.
Experimental study of a one-wavelength MHD induction generator p0167 A70-39988
- Preliminary experimental results from a one-wavelength MHD induction generator p0169 A70-40015
- Recent experimental results from a one-wavelength MHD induction generator. p0179 A72-29364
- Magnetohydrodynamic generator experimental studies [NASA-CR-127891] p0249 N72-30655
- PINDER, R. S.
New developments in degradation-resistant CdS solar cells p0033 A70-43537
- Integrated high voltage cadmium sulphide solar batteries p0034 A71-16058
- PIROGOVSKII, V. V.
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models p0144 A69-23463
- PITCHER, E. W.
Five six zero-watt portable thermoelectric power module Final report [AD-662770] p0193 N68-15230
- PITROLO, A. A.
Multihundred watt radioisotope thermoelectric generator /MMW-RTG/ p0176 A71-38927
- PITTENGER, L. C.
Experimental two phase liquid-metal MHD generator program [AD-747323] p0250 N73-12064
- PITTMAN, F. K.
Nuclear energy source limitations for dynamic energy conversion systems p0195 N68-17794
- PITTS, J. H.
Conceptual design of a 10-MW sub e nuclear Rankine system for space power [UCRL-50382] p0205 N68-30760
- Rankine cycle systems studies for nuclear space power [UCRL-70863] p0218 N69-23173
- PLESHANOV, A. S.
Optimum MHD generator with channel of constant cross section. p0130 A68-30712
- General analysis of an optimal MHD generator with a channel of constant cross-sectional area p0164 A70-24570
- PLISGA, M. J.
Separator materials for long life, high rate thermal cells. p0261 A68-42515
- PLOTKOWIAK, J.
Thermodynamic aspects in two phases for space applications p0196 N68-17799
- PODEWELTZ, C. M.
A survey of equilibrium fuel-cycle costs for a low-enriched, unclad, helium-cooled UO₂-graphite reactor [ORNL-TM-1789] p0078 N68-12420
- A study of metallic uranium fueled pressurized water reactors for the production of process heat or electric power [ORNL-TM-2451] p0232 N70-25646
- PODKULSKI, S. P.
Characteristics of a thermionic converter with a chloride vapor deposited tungsten emitter /110/ and a nickel collector [NASA-CR-1416] p0222 N69-32553
- POHLMAN, D. J.
Aircraft and air pollution, selected readings [AD-735943] p0099 N72-23655
- POHL, F. A.
Calculation and comparison of the economics of electrochemical fuel cells p0185 A73-25346

- Calculation and comparison of the economics of electrochemical fuel cells
[NASA-TT-F-15147] p0254 N73-31991
- POLETAVKIN, P.**
Ionospheric MHD generator
[JPES-46941] p0214 N69-13670
- POLTAVTSEVA, I. S.**
Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition
p0190 A73-39619
- PONOMAREV, V. P.**
Filtration of heat carriers in earth core rocks at a depth of from 6 to 8 kilometers
p0090 N70-16588
- POPE, R. B.**
An analysis of linear focused collectors for solar power.
p0046 A73-38409
Analysis of linear focused collectors for solar power
[SLA-73-5319] p0068 N73-33007
- POPOV, B. V.**
Theoretical investigation of combustion-product parameters for a natural gas burning in oxygen
p0075 A72-29451
- POPYBIN, L. S.**
Analysis of thermal economy of combined power installations employing open-cycle MHD generators
[AD-753031] p0252 N73-18090
- POREPIREV, V. V.**
Effect of electron screening on thermonuclear reactions under high densities
[ITP-69-7] p0223 N69-34199
- POSKIN, M.**
State of development of an actinium fueled thermionic generator.
p0075 A72-36169
Large scale production of Ac-227 and development of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287] p0098 N72-16196
- POST, R. F.**
Mirror systems - Fuel cycles, loss reduction, and energy recovery
[UCRL-71753] p0092 N71-28899
Fusion power - Direct conversion and the reduction of waste heat
[TID-25474] p0237 N70-39141
Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736
Experimental and computational investigations of the direct conversion of plasma energy to electricity
[CONF-710607-126] p0244 N71-38463
- POSTMA, H.**
Preliminary appraisal of the hazards problems of a D-T fusion reactor power plant
[ORNL-TM-2822] p0015 N70-37097
- POSTNIKOV, I. M.**
Liquid-metal MHD systems with laminar flow and electric power generation by the synchronous principle
p0148 A69-27491
- POTUSHANSKIY, A. A.**
Result of geothermal measurements in deep boreholes of petroleum-bearing regions of the Ukraine
p0090 N70-16587
- POWELL, J. R., JR.**
A liquid-metal MHD power generation scheme using intermittent vaporization.
p0149 A69-27492
Pollution-free hybrid fossil-nuclear fueled MHD power cycle
[BNL-12319] p0202 N68-26381
Hybrid fossil-nuclear fueled MHD power cycles
[BNL-12569] p0082 N69-11230
- POWERS, W. L.**
A graphical presentation of magnetoquasidynamic accelerator and generator performance characteristics.
p0119 A68-12258
- PRACHT, W. E.**
A theoretical study of geothermal energy extraction.
p0075 A73-16382
- PRADOS, J. W.**
Coated-particle fuels
[ORNL-4324] p0083 N69-19605
- PREB, L. L.**
High-frequency variable fluid and variable field velocity MHD generator.
p0150 A69-27502
- PRESTIAKOV, V. S.**
Investigation of a liquid-metal jet MHD generator
p0151 A69-27511
- PRESTIAKOV, A. A.**
The dawn of solar metallurgy
[NLL-M-2283C-(5828.4F)] p0067 N73-20584
- PREUKSCHAT, A. M.**
Satellite power-conditioning and control - A summary of design possibilities
[ESRO-TM-54/ESTEC/1] p0047 N68-18466
Power systems in ESRO satellites
[ESRO-TM-83] p0057 N70-17621
- PROK, G. M.**
Energy required for proton production by electron impact in mixtures of atomic and molecular hydrogen
[NASA-TM-X-52344] p0116 N68-24657
- PROKUDIN, V. V.**
Work on magnetohydrodynamics /symposium in the USA/
p0241 N71-26458
- PRUSCHEK, R.**
Results of studies on thermionic reactor systems
[REPT.-68-007] p0201 N68-21856
- PSCHUNDER, W.**
Silicon solar cell technology of the seventies
p0034 A71-16103
Some innovations in silicon solar cell technology.
p0038 A72-28029
Contribution to silicon solar cell technology.
p0039 A72-37780
- PSHENICHNOV, M. M.**
Analysis of thermal economy of combined power installations employing open-cycle MHD generators
[AD-753031] p0252 N73-18090
- PUCILLO, G. L.**
Integrated thermoelectric generator/space antenna combination
[NASA-CASE-IER-09521] p0246 N72-12136
- PUNCHARD, W. F. B.**
Development of pulsed high energy inductive energy storage systems, volume 1
[AD-755359] p0267 N73-23014
Development of pulsed high energy inductive energy storage systems. Volume 3: Weight optimization for energy storage, coil, cryogen and dewar
[AD-755360] p0267 N73-26054
- PURONIT, R. K.**
Efficiency calculations of heterojunction solar energy converters.
p0026 A69-30034
- PURVES, C. G.**
The remote sensing of oil slicks by radar
[AD-709982] p0258 N70-42226
- PUSHKAREV, O. E.**
The optimum dynamic regimes of MGD energy converters.
p0142 A69-23095
- PUSHKARESKIY, A. S.**
Thermoelectric generators
[AD-741858] p0248 N72-29045
- PUZYNOVICH, I. U. T.**
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models
p0144 A69-23063
- PUZYREV, M. M.**
Development of seismic prospecting methods in the USSR
p0086 N68-17607
- PYLININA, S. M.**
Development and production of electrical machines and magnetic systems using superconductors
p0173 A71-32274

Q

- QUARTERO, C.**
A fuel conservation study for transport aircraft utilizing advanced technology and hydrogen fuel
[NASA-CR-112204] p0102 N73-11019

- QUAST, A.**
Design and dimensioning of a nuclear power supply installation with an in-core thermionic reactor p0142 A69-20871
Possible space application of nuclear power supply, particularly for direct TV-broadcasting [BMBW-PB-W-70-16] p0233 N70-30407
- QUIESSER, H. J.**
Impurity photovoltaic effect in silicon. p0027 A69-35679
- Theoretical efficiency considerations for photovoltaic energy converters p0248 N72-27058

R

- RAAG, V.**
Design and performance analysis of panel-type solar thermoelectric generators. p0026 A69-15675
Design and performance analysis of silicon-germanium RTG's. p0161 A69-42260
Solar thermoelectric generator design and panel development program [NASA-CR-72340] p0046 N68-12252
Flat plate thermoelectric generators for solar probe missions [NASA-TN-X-52451] p0050 N68-31018
- RABCHEVSKY, G. A.**
The feasibility of detecting subsurface coal fires in Wyoming and Montana from the ground, on aerial photography and on satellite imagery p0107 N73-22384
- RABENHORST, D. W.**
Material requirements for the superflywheel. p0263 A73-14744
New concepts in mechanical energy storage. p0263 A73-25979
Primary energy storage and the super flywheel [AD-697906] p0265 N70-22537
- RABENHORST, H.**
New results on the development of a thin-film p-CdTe-n-CdS heterojunction solar cell. p0041 A73-14220
A model of a thermophotovoltaic radionuclide battery. p0185 A73-23279
- RADCHENKO, R. V.**
Peculiarities of magnetoasdynamic converters employing the Rankine cycle p0131 A68-31228
Special characteristics of installations with magnetoasdynamic converters working on the Rankine cycle. p0140 A69-14154
- RADCLIFFE, D. R.**
Biological effects of oil pollution - Bibliography. A collection of references concerning the effects of oil on biological systems [PB-188206] p0014 N70-21569
- RADEBOLD, R.**
Energy conversion with liquid-metal working fluids in the MHD-staustahlrohr. p0147 A69-27482
- RAGOT, P.**
All-metal thermionic nuclear module [CEA-CONE-1041] p0218 N69-24985
- RAGOZINSKIY, A. I.**
Isotopic electric power sources for radiometeorological stations p0201 N68-21974
- RAIBLE, C. J.**
The association of automotive fuel composition with exhaust reactivity [BM-RI-7756] p0109 N73-27542
- RAKHIMOV, A. T.**
Soviet studies on magnetohydrodynamic generators [JPBS-48041] p0219 N69-26241
Magnetic hydrodynamics of flow in MHD ducts p0219 N69-26242
- RAKHMANIN, G. D.**
The three-index transport problem p0257 N68-14618

- RALPH, E. L.**
Solar arrays utilizing large area silicon solar cells. p0028 A69-35708
Low temperature and low solar intensity characteristics of silicon solar cells p0034 A71-16071
Feasibility of low cost silicon solar cells. p0041 A73-14251
Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jul. - 1 Oct. 1969 p0056 N69-40952
[NASA-CR-106379]
Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jan. - 1 Apr. 1970 p0057 N70-25500
[NASA-CR-109527]
Development of an integrated lightweight flexible silicon solar cell array Final report p0059 N70-43081
[NASA-CR-110913]
- RAHAKUSAR, R.**
Performance studies on a rechargeable hydrogen-oxygen fuel cell. p0186 A73-25988
- RANEY, J. T.**
Environmental considerations in the regulatory process for plants in the U.S.: The role of the public and public understanding [IAEA-SM-146/5] p0017 N71-35176
- RANPEL, G.**
Optimization of design parameters for spacecraft nickel-cadmium cells containing recombination and control electrodes Quarterly report, Aug. - Oct. 1968 p0265 N69-24894
[NASA-CR-100813]
- RAHNEY, E. W.**
Solar cells p0032 A70-22050
- RAO, K. R.**
A cylindrical coaxial MHD generator p0165 A70-24855
- RASCH, W.**
Design and dimensioning of a nuclear power supply installation with an in-core thermionic reactor p0142 A69-20871
The incore-thermionic-reactor as power supply for a direct-to-home TV satellite p0173 A71-32853
Applications for incore-thermionic-reactors. p0181 A72-36166
Problems of energy supply p0201 N68-21480
Possible space application of nuclear power supply, particularly for direct TV-broadcasting [BMBW-PB-W-70-16] p0233 N70-30407
- RASHUSSEY, E.**
Concept for a high voltage solar array with integral power conditioning. p0044 A73-26901
- RASOR, M. S.**
Engineering aspects of thermionic energy conversion p0229 N70-16226
Practical aspects of fundamental research in thermionic conversion Final technical report, 1 Mar. - 1 Sep. 1969 p0232 N70-26434
[AD-699944]
- RATAJCZAK, A. P.**
Thermal cycling test of a flexible solar cell module [NASA-TN-X-52995] p0061 N71-21206
- RATH, J.**
Optical and technological problems of solar cell generators p0050 N68-28745
- RAUSCHENBACH, H. S.**
Electrical output of shadowed solar arrays. p0028 A69-35709
- RAY, W. E.**
Solar panel test set [AD-707345] p0059 N70-38210
- RAYLE, W. D.**
Plasma heating and containment p0229 N70-18729
- READ, E. D.**
Photovoltaic power systems on flight spacecraft Lunar Orbiter 3 p0054 N69-29374
[NASA-CR-100700]

- REAN, L. W.
Performance of a Brayton-cycle power conversion system using a helium-xenon gas mixture
p0175 A71-38908
- REARDON, D. E.
Nuclear power system study.
p0184 A73-22799
- REBER, H.
Gas-tight lead storage battery, requiring no attention
p0262 A70-46352
- REBNAM, J.
Configuration selection and perturbation effects for a large orbiting solar array.
p0023 A68-16784
- RECKER, H.
Supplementary material to the report nuclear fuel requirements and costs of various reactor types in Germany, KFK 366
[KFK-466]
p0081 N68-22608
- REDDING, T. E.
Evaluation testing of a closed Brayton-cycle electrical-power-conversion system.
p0185 A73-25983
Power generation and cryogenic gas storage systems study for post AAP 1-4 manned missions
[NASA-TN-X-61072]
p0048 N68-23182
- REDKOBORODYI, YU. M.
Effect of electron screening on thermonuclear reactions under high densities
[ITF-69-7]
p0223 N69-34199
- REED, L.
Determine utility of ERTS-1 to detect and monitor area strip mining and reclamation
[E73-10641]
p0107 N73-25338
- REED, W. E.
Proposed stratigraphic controls on the composition of crude oils reservoirs in the Green River formation, Uinta Basin, Utah.
p0076 A73-25471
- REESLUND, K.
Plasma research in Denmark
p0216 N69-18448
- REEDER, J. E.
Regional landscape change: A case for ERTS-1
[E72-10265]
p0103 N73-12364
Geographic applications of ERTS-A imagery to rural landscape change
[E72-10355]
p0103 N73-14343
Geographic analysis of landscape change from ERTS-1 imagery
[E73-10661]
p0108 N73-25357
Geographic analysis of landscape change from ERTS-1 imagery
[E73-10694]
p0108 N73-25386
Applications of ERTS-1 data to landscape change in eastern Tennessee
[E73-10843]
p0110 N73-28421
- REINHARTZ, K. K.
Review of advanced solar generator development.
p0038 A72-28005
Study of the Cu/x/S barrier layer in Cu-Cd-S solar cells.
p0038 A72-28008
Design of solar cell arrays and their performance in space
p0057 N70-22507
A study of advanced solar array design Quarterly report, 1 Aug. - 31 Oct. 1969
[ESRO-CR-12]
p0058 N70-30140
- REINHARTZ, J. J.
Plasma heating and containment
p0229 N70-18729
- RESECK, K. W.
Performance characteristics of a combustion-driven magnetic power generator
p0202 N68-23346
- REYNOLDS, J.
Application of radioisotopes for aerospace waste reclamation and water systems
[AMRI E-67-158]
p0080 N68-21041
- REZGOL, I.
Power characteristics of a solar thermoelectric generator.
p0030 A70-10752
- RHODES, M. D.
Calorimetric, optical, and vibration investigations of stretch-formed aluminum solar concentrators
[NASA-TN-D-4889]
p0052 N69-10708
Calorimetric evaluation of two cone-column solar-energy concentrators
[NASA-TN-D-5109]
p0053 N69-21088
Calorimetric evaluation of three 1.5-meter-diameter inflatable rigidized solar concentrators
[NASA-TN-D-5234]
p0054 N69-28123
- RIABIKOV, S. V.
Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity
p0185 A73-23473
- RIABININ, A. G.
Elements of the general transient-response theory of liquid-metal conduction MHD generators
p0150 A69-27506
- RIBE, P. L.
Direct conversion of thermonuclear plasma energy by high magnetic compression and expansion.
p0190 A73-41676
Energy storage and switching with superconductors
[LA-DC-12990]
p0267 N72-17829
- RICH, E. I.
Structural and lithologic study of northern coast ranges and Sacramento Valley, California
[E73-10478]
p0107 N73-21315
Relation of ERTS-1 detected geologic structure to known economic ore deposits
[PAPER-G18]
p0109 N73-28249
- RIDBALGH, J. L.
Cost-effective radioisotope thermoelectric generator designs involving Cm-244 and Pu-238 heat sources.
p0188 A73-38389
- RIDMUELLER, W.
Experimental investigation of instabilities in a potassium-seeded argon plasma in crossed electric and magnetic fields.
p0143 A69-23457
- RIZTJEHS, L. H. TH.
The effects of electrode configuration on the performance of a Faraday type MHD generator.
p0179 A72-29353
- RIGAMONTI, G.
Possibilities and problems of gas turbine application for ground motion machines
[PUBL-18]
p0227 N70-13927
- RINALDINI, C.
Can thorium compete with uranium? An assessment for heavy-water and graphite moderated reactors
[EUR-4264.E]
p0085 N69-31081
- RITCHIE, A. W.
Hydrocarbon fuels for advanced systems
[AD-737372]
p0100 N72-23806
- ROBERTS, A. S., JR.
A supercritical thermodynamic power cycle with MHD generator.
p0156 A69-31914
Thermodynamic analysis of a supercritical mercury power cycle
[AE-355]
p0224 N69-35785
- ROBERTS, F. S.
Signed digraphs and the growing demand for energy
[E-756-NSF]
p0018 N72-20948
- ROBERTS, J. J.
Analytical and experimental studies of liquid-metal Faraday generators.
p0148 A69-27485
- ROBERTS, R.
Some aspects of Japanese energy-conversion research and development
[AD-739325]
p0248 N72-27067
- ROBINSON, E.
Electrode processes in MHD generators.
p0139 A58-43071
- ROBINSON, H. H.
Static bed reactor for studies of a plutonium hexafluoride volatility process
[RFP-1048]
p0080 N68-19265

- ROBINSON, R. A.
Isotopes kilowatt program. Task 1 - Conceptual design and evaluation
[ORNL-TM-2366] p0233 N70-29364
- ROCHER, R.
Review of the NASA Brayton System Technology Program.
p0185 A73-25982
- RODICHEV, B. Ia.
Reflector characteristics of a solar power installation with photoelectric converters
p0027 A69-32798
- RODIER, J.
The usefulness of the decay rate in the management of radioactive waste stocks
[CEA-R-3731] p0087 N69-38022
- RODOT, R.
Cadmium telluride solar photocells
p0050 N68-28744
Photovoltaic devices and systems
p0056 N70-16228
- ROGERS, G. I.
Secondary cells with lithium anodes and immobilized fused-salt electrolytes.
p0262 A69-15330
- ROHR, P. J.
High temperature fuel cell system for the conversion of methane.
p0182 A73-15118
- ROM, P. E.
Nuclear power for surface effect vehicle and aircraft propulsion
[AIAA PAPER 70-1221] p0008 A71-22779
What can nuclear energy do for society.
p0177 A72-14376
The potential of nuclear power for high-speed ocean-going air-cushion vehicles
[NASA-TM-X-18711] p0013 N69-35723
What can nuclear energy do for society?
[NASA-TM-X-67963] p0017 N72-11844
- ROSA, R. J.
Magnetohydrodynamic Energy Conversion.
p0134 A68-42500
Plasma MHD power generation.
p0138 A68-42581
Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411
MHD power generation - State of the art and prospects for advanced nuclear applications
p0243 N71-33661
MHD generator performance limitations
p0253 N73-28655
- ROSE, D. J.
On the feasibility of power by nuclear fusion
[ORNL-TM-2204] p0204 N68-30162
- ROSEN, G.
Trends in aircraft propulsion
[CAST PAPER 72/10] p0174 A71-37600
- ROSEN, B.
A solar array optimal power conversion technique.
p0023 A68-17380
- ROSENFELD, E. I.
The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel
p0075 A73-12955
- ROSHCHIN, A. E.
Analysis of thermal economy of combined power installations employing open-cycle MHD generators
[AD-753031] p0252 N73-18090
- ROSS, R. G., JR.
Solar-panel approaches for a Venus-Mercury flyby
p0033 A70-41010
Parametric study of the performance characteristics and weight variations of large-area roll-up solar arrays
[NASA-CR-115821] p0060 N71-13427
Rollup subsolar array. Volume 2 - Detailed test results Final report
[NASA-CR-118066] p0061 N71-23714
The development, design and test of a 66 W/kq (30-W/lb) roll-up solar array
[NASA-CR-128196] p0065 N72-32070
- ROSS, R. L.
Electromechanical energy conversion devices utilizing both conventional and rare earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168
- ROSSIYEVSKIY, G. I.
On the effectiveness of enriching air with oxygen in installations with MHD generators
[SM-74/201] p0211 N69-13327
The effect of the output on the thermal efficiency in electric power stations using MHD generators
[SM-74/204] p0211 N69-13329
- ROTH, J. R.
Plasma heating and containment
p0229 N70-18729
- ROTHMAN, M. A.
Plasma heating by the fast hydromagnetic wave.
p0122 A68-19482
- ROTHWART, F.
Electromechanical energy conversion devices utilizing both conventional and rare earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168
- ROTTIER, G.
Lumiduc architecture
[NASA-TT-F-14963] p0068 N73-26976
- ROUKLOVE, P.
Detailed design of a 100-We multicell thermionic power supply.
p0180 A72-34583
Thermionic converter and generator tests
[NASA-CR-94154] p0201 N68-21597
- ROUX, M.
Bibliographic compilation and tabulation of resources, of their consumption and their waste in the world
[LRP-63/73] p0021 N73-30975
- ROWELL, E. E.
Recent Soviet investigations in geothermy
[AD-750128] p0104 N73-15454
- RUBANOVICH, I. M.
Determination of the optimal dimensions of high-temperature cylindrical-cavity solar energy receivers.
p0023 A68-12549
- RUBASHOV, I. B.
Electroquasidynamic generator
p0131 A68-31227
Electroquasidynamic generator.
p0140 A69-14153
- RUBIN, E. S.
Electrode size effects in combustion-driven MHD generators
p0169 A70-40005
Effects of electrode size on the performance of a combustion-driven MHD generator
p0173 A71-29880
Effects of electrode size on the performance of a combustion driven MHD generator Technical report Jul. 1966 - Jul. 1969
[AD-694039] p0228 N70-14933
- RUBINSTEIN, M. A.
Commercial thermoelectric generator applications and economic considerations
p0165 A70-25033
- RUCH, R.
Parametric analysis of radioisotope cascaded thermoelectric generators
[NASA-TM-X-15011] p0192 N68-14585
- RUDEY, R. A.
Aircraft engine pollution reduction
[NASA-TM-X-68129] p0102 N72-32754
- RUDRAIAH, N.
Effect of heterogeneity and Hall current on the MHD power generator.
p0182 A73-10434
- RUEBAUGH, M. E., JR.
Combustion and propulsion
[AGARDGRAPH-81] p0195 N68-17793
- RUPPO, A. S.
Specialized computer for the calculation of optimum parameters of technological processes
[AD-682791] p0084 N69-26099
- RUSSELL, O. R.
Study of application of ERTS-1 imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10064] p0102 N72-32336

- Study of the application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10193] p0102 N73-10372
- Study of application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10371] p0105 N73-19366
- Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10776] p0108 N73-27252
- Application of EREF imagery to fracture related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277
- Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-10970] p0111 N73-30311
- Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-11034] p0112 N73-31338
- RYABININ, A. G.**
Elements of the general theory of transient work processes of liquid-metal MHD conduction type generators
[AD-680712] p0220 N69-26620
- RYAN, R. L.**
Isotope reentry vehicle design study preliminary design - Phase 2 Final report
[NASA-CR-72555] p0223 N69-34989
- RYLAND, L. B.**
Hydrocarbon fuels for advanced systems
[AD-737372] p0106 N72-23806
- RYZHKOV, V. S.**
Series of no-contact synchronous generators with outputs up to 100 kV for wind driven electric units
[AD-742641] p0101 N72-31082
- S**
- SAARI, M. J.**
Topics on Rankine cycle power systems technology
p0208 N69-12577
- SAASKI, E. W.**
Optimization of the quasi-vacuum mode thermionic converter
p0172 A71-25899
- SABANSKII, I. I.**
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models
p0144 A69-23463
- SABOL, A. P.**
Crossed-field MHD plasma generator/ accelerator Patent
[NASA-CASE-XLA-03374] p0239 N71-15562
- Self-repeating plasma generator having communicating annular and linear arc discharge passages Patent
[NASA-CASE-XLA-03103] p0240 N71-21693
- SAFRONOV, B. G.**
Energy characteristics of a coaxial plasma source.
p0115 A72-26754
- SAGDEEV, R.**
Controlled thermonuclear reactions - An ocean of energy
[AD-691465] p0225 N69-40792
- SAHA, R.**
Secondary ionisation and its possible bearing on the performance of a solar cell.
p0040 A73-12048
- SAHAI, R.**
Heterojunction solar cell calculations
p0033 A71-40623
- Heterojunction solar cell calculations
[NASA-CR-49827] p0056 N70-12119
- SABINKAYA, Y. E.**
Minimum-energy control of a class of electrically driven vehicles.
p0177 A72-17304
- SAITA, J. C.**
Fuel considerations in the US supersonic transport program
[AD-696588] p0117 N70-18542
- SAKR, I. A.**
Experimental measurements of concentrated solar energy pattern in focus of a plane segments concentrator.
p0025 A68-41092
- SALATRE, R. E.**
Five-kilowatt hydrazine/air fuel cell modules
Final technical report, 9 Apr. 1965 - 24 Jul. 1966
[HRB4026F] p0191 N68-11503
- Power generating subcomponent/fuel cell module
[AD-744477] p0249 N72-32778
- SALLES, Y.**
Solar arrays for terrestrial applications and sounding balloons.
p0042 A73-14253
- SALVAT, M.**
Investigation of argon discharges with metal capillary cathodes.
p0143 A69-23450
- The effect of the electrode geometry on the currents and potentials in MHD generators
[IEP-3/68] p0207 N68-38458
- SAMULSKI, J.**
Preliminary experiments on the striated-flow induction synchronous MHD generator.
p0128 A68-23931
- Experiments on a striated-flow induction synchronous MHD generator.
p0145 A69-23487
- SANDERS, L. G.**
Thermionic power generation.
p0119 A68-12062
- SANDERSON, H. A.**
Pulsed power fuel cells
p0166 A70-27758
- SANDSTEDE, G.**
From electrocatalysis to fuel cells; Proceedings of the Seminar, Seattle, Wash., December 9-11, 1970.
p0180 A72-33876
- SAUNDERS, D. F.**
Evaluation of commercial utility of ERTS-A imagery in structural reconnaissance for minerals and petroleum
[E73-10004] p0104 N73-15340
- ERTS-1 imagery use in reconnaissance prospecting: Evaluation of commercial utility of ERTS-1 imagery in structural reconnaissance for minerals and petroleum
[E73-10414] p0105 N73-20376
- Evaluation of commercial utility of ERTS-A imagery in structural reconnaissance for minerals and petroleum
[E73-10523] p0107 N73-23414
- Evaluation of commercial utility of ERTS-A imagery in structural reconnaissance for minerals and petroleum
[E73-10700] p0108 N73-25392
- Evaluation of commercial utility of ERTS-A imagery in structural reconnaissance for minerals and petroleum
[PAPER-G30] p0109 N73-28261
- SAWYER, R. F.**
Pollutants from methane fueled gas turbine combustion.
[ASME PAPER 72-WA/GT-3] p0075 A73-15867
- SCHAFER, R. E.**
The multi-hundred watt RTG - Technology background and flight systems program.
p0189 A73-38418
- SCHALCH, D.**
Practical limits of radiophotovoltaic conversion systems.
p0185 A73-23286
- SCHARF, W.**
Possible space application of nuclear power supply, particularly for direct TV-broadcasting
[BMFW-PB-W-70-16] p0233 N70-30407
- SCHARMANN, A.**
Practical limits of radiophotovoltaic conversion systems.
p0185 A73-23280
- SCHEGOLEV, G. N.**
Thermodynamic characteristics of high temperature open cycles
[SM-74/235] p0212 N69-13345

- SCHIKARSKI, W.**
An approach to compare air pollution of fossil and nuclear power plants
[CONF-700810-20] p0016 N71-13756
- SCHILLER, T. G.**
A 1.5 kw fuel cell powerplant
[AD-730796] p0286 N72-14040
- SCHIMMEL, W. E., JR.**
An analysis of linear focused collectors for solar power.
p0046 A73-38409
Analysis of linear focused collectors for solar power
[SLA-73-5319] p0068 N73-33007
- SCHLOSSER, W. H. J.**
Transformation, transport and accumulation of energy in hydrostatic power transmission systems
p0257 A71-36202
- SCHLOTTER, W. J.**
Nimbus 2 - Photovoltaic power systems on flight spacecraft
[NASA-CR-62045] p0202 N68-24455
- SCHMIDT, E. F.**
Systems considerations using fuel cells
p0203 N68-28738
- SCHNEIDER, A.**
Feasibility study of a 110 watt per kilogram lightweight solar array system
[NASA-CR-130287] p0066 N73-15079
- SCHNEIDER, G.**
Investigations on CdTe thin film solar cells.
p0045 A73-30475
- SCHNEIDER, R. T.**
Development of plasma diagnostic methods applicable to direct energy conversion, summary
Final technical report
[AD-702405] p0233 N70-29012
Research on Uranium Plasmas and their Technological Applications
[NASA-SP-236] p0242 N71-33626
- SCHOECK, P. A.**
The electrofluid dynamic energy converter with spacecharge neutralization
p0216 N69-18450
- SCHORR, A. W.**
The design, modeling, and optimization of a space oriented radioisotope thermoelectric power supply
p0251 N73-16636
- SCHREGER, A.**
Parallel operation of the solar generator and battery on the Symphonie satellite
p0039 A72-36687
- SCHREINK, G. L.**
Solar collection limitations for dynamic converters.
[AGARDOGRAPH 81] p0024 A68-22516
Solar collection limitations for dynamic converters
p0047 N68-17795
- SCHROCK, V. E.**
Radioisotopic power generators State of the art report
[AD-687131] p0223 N69-32804
Heat transfer from radioisotopic power sources in porous media
[AD-691213] p0225 N69-40031
- SCHROEDER, R.**
Physics investigations of uranium-fueled fast steam-cooled reactors in SNEAK, assemblies 3A-0, 3A-2, 3A-3
[ENFNR-608] p0085 N69-31161
- SCHUBERT, J. S.**
Digital analysis of Potomac River Basin ERTS imagery: Sedimentation levels at the Potomac-Anacostia confluence and strip mining in Allegany County, Maryland
[PAPEE-E13] p0110 N73-28277
- SCHULTZ, D. F.**
Comparison of ASTM-A1 and natural gas fuels in an annular turbojet combustor
[NASA-TM-X-52700] p0087 N70-12102
- SCHULZ, T.**
Experimental results with a liquid-metal MHD induction converter.
p0151 A69-27509
- SCHUNANN, P. A.**
Fuel capsule vent system development for the Viking radioisotope thermoelectric generator.
p0077 A73-40766
- SCHWARTZ, H. J.**
Isotope Brayton space power systems and their technology.
p0183 A73-20467
- Direct energy conversion
p0208 N69-12585
- SCHWARTZ, R. J.**
P-i-n structures for controlled spectrum photovoltaic converters.
[AGARDOGRAPH 81] p0126 A68-22549
P-i-n structures for controlled spectrum photovoltaic converters
p0199 N68-17830
- SCOTT, J. L.**
Fabrication and irradiation behavior of uranium mononitride.
p0074 A72-22406
- Coated-particle fuels
[ORNL-4324] p0083 N69-19605
- SCOTT, H. H.**
Fluctuations in series connected open cycle MHD generators
[AD-721454] p0242 N71-28680
- SEAPKER, H. E.**
Solar charger kit experimental
[AD-734809] p0063 N72-19066
- SECTOROV, V. R.**
The first aerodynamic three-phase electric power plant in Balaklava
[NASA-TT-P-14933] p0107 N73-24268
- SECUNDE, R. R.**
Experimental evaluation of the electrical subsystem of the 2-to-15 kW Brayton power conversion system
p0175 A71-38910
- SEEGER, W.**
Experimental work on inductive magnetoplasma dynamic converters.
p0146 A69-23490
- Magnetoplasma dynamic /MPD-/ converters
[DLR-FB-69-85] p0232 N70-26208
- SEHGAL, H. K.**
Investigation on silicon p-n junction for solar energy conversion.
p0024 A68-31623
- SEIKEL, G. R.**
The potential of nuclear MHD electric power systems
[NASA-TM-X-67829] p0241 N71-24578
- SEKIYA, K.**
Research on radioactive dust in the air at KUR operation
[KURRI-TR-56] p0091 N70-21010
- SELDEWATH, T. E.**
Prognosis of the world energy supply between now and the year 2000 with reference to the quantity of energy raw materials consumed
[NLL-TRANS-1166-(9022.9)] p0096 N71-35501
- SELMAN, J. R.**
Development of high-specific-energy batteries for electric vehicles
[ANL-7953] p0267 N73-19061
- SENKO, Y. I.**
Measuring devices of a computer control system for automating heavy duty power units of a thermoelectric power station
[AD-727461] p0244 N71-38010
- SEREDYNSKI, J.**
Investigations on CdTe thin film solar cells.
p0045 A73-30475
- SEXTON, G. S.**
Naval surface ship Arctic missions. Volume 2, appendix A - Arctic resources
[AD-716415] p0094 N71-19770
- SHAN, H. H.**
Prospects of solar power plants in India
[N7] p0054 N69-24313
- SHAKHOV, I. I.**
The optimum load selection of a sectioned MHD generator
p0164 A70-24156
- Selection of optimum conditions at the inlet of an MHD-generator channel
p0172 A71-22136
- SHAKHOV, A. A.**
Biological problems of solar energy conversion
p0032 A70-31600

- Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- SHAKHTAHIN, V. B.
Development and production of electrical machines
and magnetic systems using superconductors p0173 A71-32274
- Superconductors in marine technology
[AD-755711] p0252 N73-22702
- SHAKUN, W.
A technique for determining the operational
characteristics of a thermoelectric module. p0178 A72-27721
- SHALABIN, G. V.
The three-index transport problem p0257 N68-14618
- SHANKLIN, R. V., III
Two-terminal connected open cycle MHD generators. p0127 A68-23920
- MHD generator in two-terminal operation. p0132 A68-39717
- Factors effecting the performance of diagonal
conducting wall open cycle MHD generators
[AD-721455] p0242 N71-28718
- SHANSTROM, R. T.
Progress in optimizing the gas-cooled fast breeder
reactor [GA-8932] p0081 N68-29161
- SHARMA, B. L.
Efficiency calculations of heterojunction solar
energy converters. p0026 A69-30034
- SHCHEGOLEV, G. M.
Liquid-metal MHD systems with laminar flow and
electric power generation by the synchronous
principle p0148 A69-27491
- Experimental investigation of the performance of a
porous electrode in an MHD converter during the
injection of argon with potassium addition p0190 A73-39619
- SHEPCHIK, J. J.
HTGR fuel reprocessing - Effects of including a
silicon carbide coating on fertile fuel particles
[GAND-8661] p0083 N69-17117
- SHEPSTIK, P. K.
Six-converter solar thermionic generator /JG-4/
Quarterly progress report, 1 Jul. - 15 Dec. 1967
[NASA-CR-92586] p0046 N68-15766
- Six-converter solar thermionic generator Final
report, 10 Jan. 1967 - 31 Mar. 1968
[NASA-CR-98712] p0052 N69-14920
- SHEPTEH, I.
Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- SHINDLIN, A. E.
Pulse MHD generator with a superconducting
magnetic system p0120 A68-16523
- A pulsed magnetohydrodynamic generator with a
superconducting magnetic system. p0131 A68-30774
- Magnetohydrodynamic Method of Obtaining Electrical
Energy p0141 A69-17905
- Experimental investigation of the influence of
boundary layers and certain other effects on the
characteristics of an MHD generator
[AD-685536] p0221 N69-29842
- SHINKMAN, A. G.
Peculiarities of magnetogasdynamic converters
employing the Rankine cycle p0131 A68-31228
- Special characteristics of installations with
magnetogasdynamic converters working on the
Rankine cycle. p0140 A69-14154
- SHINKLEIN, A. V.
Applications of selective coatings in solar
thermoelectric generators. p0031 A70-10767
- Energy economics prognostication for the prospects
of solar radiation utilization p0037 A72-24316
- SHELDON, D. B.
Explosive magnetohydrodynamic program
[AD-762934] p0254 N73-30899
- SHELKOV, E. M.
Some results of an investigation of a single-
component version of a liquid-metal MHD energy
converter p0148 A69-27488
- SHELTON, S. V.
Gas core reactors for MHD power systems p0243 N71-33664
- SHEMK, I.
A method of optimization of the constant current
electromagnet in an MHD generator
[SN-74/83] p0210 N69-13317
- SHEPARD, W. P., JR.
A design concept for a 30 watts per pound rollup
solar array. p0025 A68-42560
- Feasibility study of a 30 watts per pound roll up
solar array Quarterly technical report, 1 Jan.
- 31 Mar. 1968 p0048 N68-21879
- [NASA-CR-94243]
- Feasibility study 30 watts per pound roll-up solar
array Final report p0051 N68-32561
- [NASA-CR-96230]
- Rollup subsolar array. Volume 2 - Detailed test
results Final report p0061 N71-23714
- [NASA-CR-118096]
- Feasibility study of a 110 watt per kilogram
lightweight solar array system
[NASA-CR-130287] p0066 N73-15079
- SHEPHERD, L. R.
Nuclear reactors as a source of power in space p0226 N70-11305
- SHERMAN, A.
Gaseous fission closed loop MHD generator p0243 N71-33632
- SHERMAN, G. W.
Performance forecast of selected static energy
conversion devices
[AGARD-CP-21] p0203 N68-28714
- SHERWOOD, P. J.
Fabrication and preliminary testing of a 3kW
hydrogen resistor. p0115 A72-26186
- [AIAA PAPER 72-449]
- Hydrogen resistors for primary propulsion of
communications satellites. p0009 A73-15741
- SHEVCHENKO, V. R.
Investigation of supersonic radial nozzles for
MHD-generators
[FTD-MT-24-208-67] p0206 N68-35663
- SHINDLIN, A. Y.
Magnetohydrodynamic method of producing electrical
energy, part 1 p0251 N73-16687
- [JPRS-57940-1-PT-1]
- Magnetohydrodynamic method of producing electrical
energy, part 2 p0251 N73-16688
- [JPRS-57940-2-PT-2]
- SHIGANOV, N. A.
Investigation of the possibility of using radiant
solar energy for welding and soldering of
materials p0040 A72-45126
- SHILIN, B. V.
Thermal activity of the Uson Caldera based on
infrared and photographic aerial survey. p0077 A73-39895
- SHIMADA, K.
Electrical testing of a six-converter generator. p0026 A69-21823
- Measurements of plasma parameters in a simulated
thermionic converter p0245 N72-10252
- SHIMOTAKE, H.
A lithium/tin cell with an immobilized fused- salt
electrolyte - Cell performance and thermal
regeneration analysis. p0137 A68-42517
- Secondary cells with lithium anodes and
immobilized fused-salt electrolytes. p0262 A69-15330
- Development of high-specific-energy batteries for
electric vehicles
[ANL-7953] p0267 N73-19661

- SHIPUR, I. YA.
Magnetohydrodynamic method of obtaining electrical energy
[AD-705748] p0235 N70-34959
- SHIMLAND, F. A.
The CdS thin film solar cell. p0024 A68-34613
Status of the cadmium sulfide thin-film solar cell. p0025 A68-42518
Thin film solar cells for balloon applications. p0027 A69-31287
CdS solar cell development Final report p0054 N69-23369
[NASA-CR-72534]
- SHIVERS, B.
Application of radioisotopes for aerospace waste reclamation and water systems p0080 N68-21041
[AERL-TR-67-158]
- SHOFNER, F. M.
Quantitative thermal mapping problems. p0076 A73-33360
- SHOR, R.
Sr 90 heat sources p0096 N71-35815
[ORNL-IIC-36]
- SHPIILRAYN, E. E.
Thermodynamic analysis of new liquid-metal MHD-generator cycles p0148 A69-27489
- SHPIILRAYN, E. E.
The thermodynamics of multistage cycles of MHD installations with heat regeneration p0208 N69-11944
- SHULTZ, A. W.
The effect of advanced propulsion on future rotary wing type aircraft p0218 N69-23996
- SHUNYATSKII, B. Y.
Magnetohydrodynamic generator for a combined magnetohydrodynamic electric power plant with a first generation open cycle p0254 N73-31996
[AD-764925]
- SHVACHKOV, A. V.
Practical application of underground heat sources p0089 N70-16585
Calculations on boiler apparatus for exploiting sub-surface heat sources p0090 N70-16590
- SHURE, L. I.
Nuclear power for manned orbiting space stations [NASA-TM-X-52774] p0231 N70-25446
Large-scale terrestrial solar cell power generation cost: A preliminary assessment. [NASA-TM-X-2520] p0063 N72-19057
- SIASKIN, I. O. B.
Thermodynamic analysis of new liquid-metal MHD-generator cycles p0148 A69-27489
- SIBILLOT, P.
Development of a thermophotovoltaic converter [AGARDGRAPH 81] p0125 A68-22548
Effect of a thermophotovoltaic converter p0199 N68-17829
Germanium solar photoelectric cells. 1 - Experimental study of photovoltaic cells at high flux densities p0050 N68-28746
- SIGMAN, D. B.
Plasma heating and containment p0229 N70-18729
- SILVERMAN, R. V.
Space power supply study Final report p0206 N68-35232
[NASA-R40-68-5]
Space electrical power systems for the mid-1970's Final technical report p0233 N70-29518
[AD-701352]
- SILVERSTEIN, A.
Progress in aircraft gas turbine engine development. p0122 A68-19791
- SINON, E.
Experimental results of a one megajoule inductive energy storage system. p0261 A68-23903
- SINON, P. F.
Flat-plate collector performance evaluation. The case for a solar simulation approach p0068 N73-32655
[NASA-TM-X-71427]
- SINOWEIT, B. E.
Analysis of the mineral entrapped fatty acids isolated from the Green River Formation. p0071 A68-27231
- SIMONS, W. H.
The effect of air/fuel level in the MHD generator on the operation of an open-cycle MHD-topped power plant p0166 A70-30534
- SIMPSON, E. C.
Potential in performance improvements in air breathing propulsion. p0131 A68-33438
- SINS, W. H.
The development of a residential heating and cooling system using NASA derived technology [NASA-CR-124063] p0066 N73-17911
- SINGH, Y. P.
Effective conductivity in a segmented-electrode magnetohydrodynamic generator with elevated electron temperature. p0120 A68-15642
- SINIZER, D. I.
Frontiers of technology study. Volume 3 - Implementation [PB-178272] p0011 N68-31690
Frontiers of technology study. Volume 2 - Survey [PB-178271] p0011 N68-31703
- SKOLNIK, H. L.
A system for the evaluation of solar cell samples. p0042 A73-22438
- SKORODELOV, D. I.
Investigation of the peculiarities of pre-flame processes and ignition of hydrocarbons of various structures. Part 1 - Variation of cool flame delay and ignition delay with compression temperature and pressure p0080 N68-19175
- SKUNDIN, A. M.
The present and future of fuel cells [AD-743651] p0249 N72-33065
- SKURATOVSKII, N. O.
Reduced indices of heat removal intensity and initial temperatures in thermoelectric devices p0151 A69-28314
- SLADE, D. H.
Meteorology and atomic energy, 1968 [TID-24190] p0012 N69-17184
- SLEPISOV, V. E.
Experimental investigation of the performance of a porous electrode in an MHD converter during the injection of argon with potassium addition p0190 A73-39619
- SLONE, H. O.
Nuclear power for manned orbiting space stations [NASA-TM-X-52774] p0231 N70-25446
- SMALL, W. J.
Potential of hydrogen fuel for future air transportation systems. [ASME PAPER 73-ICT-104] p0010 A73-43499
- SHIDT, D.
Fast reactor core heat removal [EURFMR-615] p0086 N69-31655
- SHIRNOV, V. G.
Solar elements based on heterojunctions of p-type GaAs/1-x/P/x/ and n-type GaAs p0039 A72-30225
- SHIRNOVA, E. G.
Reduction of temperature in an open-cycle MHD power plant owing to injected additives. p0140 A69-14162
- SMITH, A.
Status of photovoltaic power technology. [ASME PAPER 68-WA/SOL-1] p0141 A69-16158
Status of photovoltaic power technology. [ASME PAPER 68-WA/SOL-1] p0028 A69-36418
- SMITH, A. C.
Activities concerning electrical, thermal, and optical properties of semiconductors related to energy conversion Final technical report, 15 Jun. 1958 - 30 Nov. 1969 p0056 N70-11427
[AD-693235]
- SMITH, A. L.
Survey of materials for thermionic converters [NASA-TM-X-2130] p0238 N71-11689
- SMITH, C. L.
Future cost of liquid hydrogen for use as an aircraft fuel. p0001 A68-33457
- SMITH, C. H.
Radiator design limitations for dynamic converters p0195 N68-17796

- SMITH, D. G.
Investigation of a nuclear fuel reprocessing plant upon its environment p0095 N71-29878
- SMITH, J. B.
Electrothermal instabilities in the entrance region of an MHD generator [NASA-TN-X-1761] p0217 N69-20875
- SMITH, J. T., JR.
Oil slick remote sensing. p0074 A72-16600
- SMITH, W. A.
Feasibility of low cost silicon solar cells. p0041 A73-14251
- SMOLENSKII, V. G.
The investigation of the effect of acoustic oscillations on the combustion process of gaseous fuel p0075 A73-12955
- SMITH, H. C.
The effect of advanced propulsion on future rotary wing type aircraft p0218 N69-23996
- SNEDDEN, R. B.
Experimental investigations of an open-cycle, vortex MHD generator [BM-RI-7699] p0251 N73-14746
- SMETSINGER, K. G.
Nuclei of pleochroic halos in biotites of some Sierra Nevada granitic rocks. p0071 A68-23286
- SNYDER, W. T.
A graphical presentation of magnetogasdynamic accelerator and generator performance characteristics. p0119 A68-12258
- SOHN, J.-C.
Contribution to the study of the oxygen electrode p0200 N68-18025
- SOLDES, A.
Instabilities in non-equilibrium M.H.D. plasmas - A review [AIAA PAPER 70-40] p0163 A70-18107
- SOLE, J.
Energy storage possibilities of superconductors with a view to large power discharges [CEA-R-3243] p0263 N68-15938
Energy storage capabilities of superconductors in view of high power discharge [NASA-TT-P-13585] p0266 N71-23515
- SONENBERG, B.
Development of a lightweight body-mounted solar cell array with a high power to weight ratio. p0046 A73-38408
- SOMMER, E. J., JR.
An induction generator experiment. p0130 A68-29309
- SOMOZA, R.
Large astronomical satellite solar paddle configurations and available power [ESRO-TN-P-5/ESTEC/] p0052 N69-15891
- SOMJU, O. K.
Comparison of experimental and analytical results for a 20-MW combustion-driven Hall configuration MHD generator p0168 A70-40003
Comparison of experimental and analytical results for a 20 MW combustion-driven Hall configuration MHD generator [RR-344] p0231 N70-24132
Experimental research on a 400 kW high power density MHD generator [AD-725739] p0245 N72-11065
Experimental and analytical research on a two megawatt, high performance MHD generator [AD-756489] p0253 N73-23765
- SOO, S. L.
Direct energy conversion. p0132 A68-36891
- SOUSSELIER, Y.
Technical aspects and economic incidents of transportation in the fuel cycle [CEA-CONF-1093] p0257 N69-27096
- SOVIE, R. J.
Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator p0165 A70-25614
- Results of initial subsonic tests in the NASA-Lewis closed loop MHD generator p0169 A70-40111
- Status of power generation experiments in the NASA Lewis closed-cycle MHD facility. [AIAA PAPER 72-103] p0177 A72-16936
- Hall current effects in the Lewis magnetohydrodynamic generator. p0184 A73-22823
- Status of power generation experiments in the NASA Lewis closed cycle MHD facility [NASA-TN-X-67975] p0246 N72-12166
- SPAGNUOLO, A. C.
Experimental evaluation of the electrical subsystem of the 2-to-15 kW Brayton power conversion system p0175 A71-38910
Design and performance of two vacuum chambers and solar simulators for solar-cell research [NASA-TN-X-1503] p0047 N68-16695
- SPAKOWSKI, A. E.
Status of the cadmium sulfide thin-film solar cell. p0025 A68-42518
Large-scale terrestrial solar cell power generation cost: A preliminary assessment [NASA-TN-X-2520] p0063 N72-19057
- SPENCER, J. D.
Review of Bureau of Mines energy program, 1970 [BM-IC-8526] p0096 N71-36393
Bureau of Mines energy program, 1971 [BM-IC-8551] p0101 N72-30123
Bureau of Mines energy program, 1972 [BM-IC-8612] p0111 N73-30335
- SPENGLER, G.
Aviation fuels and lubricants p0073 A70-29999
- SPIEWAK, I.
Application of low-cost energy to processing of sewage water for reuse p0014 N70-14519
- SPIRITO, P.
Technology and electrical characteristics of gallium arsenide solar cells p0023 A68-15419
- SPIRKIN, V. G.
Effect of sulfides contained in fuels on their operational properties p0072 A69-19456
- SPISZ, E. W.
Solar absorptances and spectral reflectances of 12 metals for temperatures ranging from 300° to 500° K [NASA-TN-D-5353] p0055 N69-31895
- SREEDHAR, A. K.
Efficiency calculations of heterojunction solar energy converters. p0026 A69-30034
- SRIDHAR, R.
Minimum-energy control of a class of electrically driven vehicles. p0177 A72-17304
- SRINIVASAN, S.
Fuel cells- Their electrochemistry p0166 A70-30105
- STAHL, W.
Thermoelectric conversion process: Application to radioisotope sources [FRNC-CONF-73] p0248 N72-28731
- STABLE, C. V.
Feasibility study of a 110 watt per kilogram lightweight solar array system [NASA-CR-130287] p0066 N73-15079
- STAKHANOV, I. P.
Physical bases of thermionic energy conversion p0190 A73-41876
- STAWCO, J.
Preliminary experiments on the striated-flow induction synchronous MHD generator. p0128 A68-23931
Experiments on a striated-flow induction synchronous MHD generator. p0145 A69-23487
- STANIUKOVICH, K. P.
Calculation of magnetohydrodynamic flows and the problem of obtaining an optimal MHD generator p0122 A68-18450
- STAPPER, G.
Electrical testing of a six-converter generator. p0026 A69-21823

- STARK, W. A.**
Transit analysis
[SC-RR-69-662] p0091 N70-21251
- STARKMAN, E. S.**
The future of vehicular power plants p0016 N70-39315
- STARR, C.**
Technology assessment. I - Weighing the benefits and risks of new technologies p0007 A71-12120
- START, G. E.**
Relative dose factors from long-period point source emissions of atmospheric pollutants p0011 N68-38380
- STAUFFER, J. H.**
Five six zero-watt portable thermoelectric power module Final report
[AD-662770] p0193 N68-15230
- STEEGER, E. J.**
Application of Isotec thermoelectric technology. p0186 A73-26034
- STEELE, E. D.**
Solar arrays utilizing large area silicon solar cells. p0028 A69-35708
- STEINBERG, M.**
Pollution-free hybrid fossil-nuclear fueled MHD power cycle
[BNL-12319] p0202 N68-26381
Hybrid fossil-nuclear fueled MHD power cycles
[BNL-12569] p0082 N69-11230
- STEINER, D.**
Fuel-cycle cost comparisons for low enriched uranium high temperature gas-cooled reactors
[ORNL-TN-2173] p0083 N69-17558
- STEINER, R.**
High temperature fuel cell system for the conversion of methane. p0182 A73-15118
- STEINSCHADEN, K.**
The use of thin film solar cells in the radiovoltaic generators. p0038 A72-28021
Prospects for radiovoltaic energy conversion p0185 A73-23278
- STEKLY, J. J.**
Lightweight superconducting MHD magnets. Volume 1: Saddle magnet design, construction and preliminary test results
[AD-745321] p0249 N73-10247
Lightweight superconducting MHD magnets. Volume 2: 10 MW level magnet system design and projections for future development
[AD-745322] p0250 N73-11717
- STEKLY, Z. J. J.**
Large superconducting magnets for M.E.D. p0122 A68-20175
Superconducting magnets for MHD generators. p0157 A69-39478
Superconducting considerations in rotating electrical machines. p0182 A73-11828
Large-scale applications of superconducting coils. p0183 A73-20107
Explosive magnetohydrodynamic program
[AD-762934] p0254 N73-30890
- STELLA, P.**
Vertical multifunction solar cell. p0041 A73-14213
- STELLA, P. M.**
Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jul. - 1 Oct. 1969
[NASA-CR-106379] p0056 N69-40952
Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jan. - 1 Apr. 1970
[NASA-CR-109527] p0057 N70-25500
Development of an integrated lightweight flexible silicon solar cell array Final report
[NASA-CR-110913] p0059 N70-43081
- STEPANOV, A. S.**
Physical bases of thermionic energy conversion p0190 A73-41876
- STEPANOV, V. G.**
Peculiarities of magnetogasdynamic converters employing the Rankine cycle p0131 A68-31228
- Special characteristics of installations with magnetogasdynamic converters working on the Rankine cycle. p0140 A69-14154
- STEPHENS, J. W.**
The performance of a family of diagonal conducting wall MHD open cycle generators p0169 A70-40004
- STERLINI, J.**
Study of two-phase media for use in MHD devices p0147 A69-27479
- STEUBENBERG, R. K.**
Development of high-specific-energy batteries for electric vehicles
[ANL-7953] p0267 N73-19061
- STEWART, W. L.**
Brayton cycle systems p0208 N69-12578
- STINGELIN, R. W.**
Detection, delineation, and monitoring of subsurface coal fires by aerial infrared scanning p0086 N69-33683
- STIRN, R. J.**
Feasibility of low cost silicon solar cells. p0041 A73-14251
- STOENESCU, M.**
Physical phenomena in magnetohydrodynamic generators p0163 A70-14716
- STOLOV, A. M.**
Study of the electrical conductivity of the plasma in coaxial-type MHD generator models p0144 A69-23463
- STONE, P. L.**
Topics on Rankine cycle power systems technology p0208 N69-12577
- STORIS, L. P.**
An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-10646] p0108 N73-25342
- STRASHNIN, E. P.**
Plasma stability and voltage fluctuations in an MHD generator p0121 A68-18285
- STRASHNIN, E. P.**
Experimental investigation of the magnetohydrodynamic generator
[SM-74/206] p0211 N69-13331
Experimental investigation of volt-ampere characteristics of a magnetohydrodynamic channel with different electrodes
[SM-74/209] p0211 N69-13332
- STREED, E. R.**
Solar cell Patent
[NASA-CASE-ARC-10050] p0062 N71-33409
- STRIZHAK, V. E.**
Investigation of a liquid-metal induction MHD generator p0151 A69-27513
- STURN, P. V.**
Construction and operation of a hydrazine-oxygen fuel cell module p0170 A70-43541
- STURN, G. P., JR.**
The association of automotive fuel composition with exhaust reactivity
[BN-BI-7756] p0109 N73-27542
- SULKIN, M. A.**
Frontiers of technology study. Volume 3 - Implementation
[PB-178272] p0011 N68-31690
Frontiers of technology study. Volume 2 - Survey
[PB-178271] p0011 N68-31703
- SULLIVAN, R. W.**
A brief overview of the energy requirements of the Department of Defense
[AD-754824] p0106 N73-20819
- SUPPA, E. G.**
New methods for the fabrication of solar arrays p0031 A70-12080
Developments in solar cell generators. p0042 A73-22439
- SURIN, S. S.**
The three-index transport problem p0257 N68-14618
- SVOB, L.**
Advances in graded gap solar cell research. p0040 A73-14207

SWANSON, E.

PERSONAL AUTHOR INDEX

- SWANSON, E.**
A fuel conservation study for transport aircraft utilizing advanced technology and hydrogen fuel [NASA-CR-112204] p0102 N73-11019
- SWEET, D. C.**
Relevance of ERTS to the State of Ohio [E72-10259] p0102 N73-12358
Relevance of ERTS-1 to the state of Ohio [E73-10032] p0104 N73-15365
Resource management implications of ERTS-1 data to Ohio [PAPER-E3] p0110 N73-28361
Relevance of ERTS to the State of Ohio [E73-10987] p0112 N73-31294
- SWIDERSKI, E. F.**
Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems. Power conditioning - Parametric screening study [WAD-67-45E] p0206 N68-32748
- SWITHENBANK, J.**
A combustion oscillator for MHD energy conversion p0175 A71-38099
- SYCHEV, V. V.**
Pulse MHD generator with a superconducting magnetic system p0120 A68-16523
A pulsed magnetohydrodynamic generator with a superconducting magnetic system. p0131 A68-30774
Certain problems in creating superconducting magnetic systems p0182 A73-10616
Transient processes in superconducting magnetic systems [SA-74/229] p0212 N69-13341
On the problem of constructing superconducting magnetic systems for MHD-generators [AD-706779] p0237 N70-37715
Superconductors in marine technology [AD-755711] p0252 N73-22702
- SZABO, E. V.**
Development of a thermoelectric converter for a nuclear energy system [BMWP-FB-W-68-10] p0202 N68-24189
- SZEGO, G. C.**
High-temperature thermoelectric material limitations. [AGARDGRAPH 81] p0125 A68-22540
Optimization of energy storage for solar space power. p0261 A68-43812
High-temperature thermoelectric material limitations p0198 N68-17820
Optimization of energy storage for solar space power, appendix 1 p0056 N70-16229
- SZEWS, A. P.**
Analysis of an optical motor system energized with a laser. p0142 A69-22457

T

- TABAKOFF, W.**
Solar concentration power and optimization of the cavity type heater for a solar source. p0027 A69-33795
- TADASHI, Y.**
Research on radioactive dust in the air at KUR operation [KURRI-TR-56] p0091 N70-21010
- TAGER, S. A.**
Development and investigation of high temperature combustor to be used for a solid fuel MHD generator and thermodynamic analysis of combustion conditions [AD-764153] p0254 N73-31848
- TAHERZADEH, M.**
Neutron radiation characteristics of plutonium dioxide fuel [NASA-CR-127045] p0101 N72-26528
- TALAAT, E.**
Design and operation of an experimental closed-loop magnetoplasmadynamic energy conversion system. p0145 A69-23483
- TALLAN, W. M.**
Electrode and insulation materials in magnetohydrodynamic generators. [AD-737019] p0178 A72-22401
- TAKAOKI, T.**
An experimental study on water-cooled metal electrodes of MHD generator. p0127 A68-23925
- TANANEV, A. V.**
Hydraulics of magnetohydrodynamic machines [AD-751465] p0252 N73-16718
- TANSENBERGER, H.**
Problems of high temperature ZrO₂ - Solid electrolyte fuel cells. p0263 A72-33894
- TAO, F. F.**
The lubricity characteristics of heavy aromatics. p0071 A68-41768
- TAPE, G. F.**
The United States' thermonuclear program. p0156 A69-29278
- TARNISHEVSKII, B. V.**
Reflector characteristics of a solar power installation with photoelectric converters p0027 A69-32798
Empirical equation for the external characteristic of a photoelectric solar generator p0031 A70-19623
- TARTH, J.**
Explosive magnetohydrodynamic program [AD-762934] p0254 N73-30890
- TASCHER, W. G.**
Evaluation of molten carbonate fuel cells p0164 A70-20703
- TATE, E.**
Electrical characteristics of a linear, nonequilibrium, MHD generator. p0133 A68-39722
Performance of a large scale, non-equilibrium MHD generator with rare gases. II p0169 A70-40012
Performance of a large scale, nonequilibrium MHD generator with rare gases p0172 A71-29879
Electrode effects and gas dynamic characteristics of a large, non-equilibrium MHD generator with cesium seeded, noble gases. p0179 A72-29356
Experiments in a large, non-equilibrium MHD generator with cesium seeded, noble gases and heated electrodes [AD-719381] p0241 N71-24600
- TAVERNIER, J.**
Germanium solar photoelectric cells. 1 - Experimental study of photovoltaic cells at high flux densities p0050 N68-28746
- TAYLOR, A. C.**
Applicability of NASA contract quality management and failure mode effect analysis procedures to the USGS Outer Continental Shelf oil and gas lease management program [NASA-TM-X-2567] p0100 N72-25955
- TAYLOR, C. E.**
Cryogenics, superconducting magnets, and fusion power: A glimpse into the future [UCRL-73187] p0019 N73-12741
- TAYLOR, D. S.**
A combustion oscillator for MHD energy conversion p0175 A71-38099
- TAYLOR, J. G. V.**
Distribution of hydrocarbon fluids and their compositions in volatile oil reservoirs during depletion p0080 N68-21048
- TAYLOR, T. B.**
Electrical and isotope power from space for terrestrial use. p0042 A73-18028
- TENNERY, V. J.**
Fabrication and irradiation behavior of uranium mononitride. p0074 A72-22406
- TENO, J.**
Operation of a 20 Mw Hall generator. p0127 A68-23919

- Comparison of experimental and analytical results for a 20-MW combustion-driven Hall configuration MHD generator p0168 A70-40003
- Comparison of experimental and analytical results for a 20 MW combustion-driven Hall configuration MHD generator [RR-344] p0231 N70-24132
- Experimental research on a 400 kW high power density MHD generator [AD-725739] p0245 N72-11065
- Experimental and analytical research on a two megawatt, high performance MHD generator [AD-756489] p0253 N73-23765
- TEPLIAKOV, D. I.
Computation and optimization of the thermal regime in concentrator-type solar devices. p0026 A69-22534
- Thermal conditions in cylindrical cavity absorbers of high-temperature solar energy converters. p0030 A70-10761
- Transport and distribution of radiation in solar energy units with mirror concentrators. p0030 A70-10762
- Energy characteristics of solar units with mirrors under service conditions. p0030 A70-10763
- TERRY, P. L.
Five-kilowatt hydrazine/air fuel cell modules
Final technical report, 9 Apr. 1965 - 24 Jul. 1966 [MRB4026F] p0191 N68-11503
- Open cycle fuel cell power plant direct currents, 1.5 kW [AD-764285] p0254 N73-30979
- TETELBAUM, S. D.
Thermodynamic efficiency of uranium-hexafluoride MHD-plants [JPRS-551261] p0247 N72-17956
- THALLER, L. H.
Advanced spacecraft fuel cell systems. p0044 A73-29596
- THIELO, W.
Studies of thermionic energy converters p0142 A69-18255
- THIRIET, D.
Accurate localization by the Geole Project satellite p0075 A73-17192
- THIRLET, L.
Comparison of the economics of reprocessing by dry and wet methods in the framework of the fuel cycle of breeder reactors [NLL-WINDSCALE-TRANS-414-9091.] p0232 N70-26388
- THOM, K.
Research on Uranium Plasmas and their Technological Applications [NASA-SP-236] p0242 N71-33626
- THOMAS, C. O.
Quantitative thermal mapping problems. p0076 A73-33360
- THOMAS, G. E.
Evaluation of commercial utility of ERTS-A imagery in structural reconnaissance for minerals and petroleum [PAPER-630] p0109 N73-28261
- THOMAS, G. L.
ERTS-1 imagery use in reconnaissance prospecting: Evaluation of commercial utility of ERTS-1 imagery in structural reconnaissance for minerals and petroleum [E73-10414] p0105 N73-20376
- THOMAS, R. L.
The utilization of solar energy to help meet our nation's energy needs. p0045 A73-32193
- The utilization of solar energy to help meet our nation's energy needs [NASA-TM-X-68230] p0067 N73-22748
- THOME, R. J.
Interaction of a traveling magnetic field with rigid conducting spheres or cylinders. p0129 A68-26140
- Large-scale applications of superconducting coils. p0183 A73-20107
- Lightweight superconducting MHD magnets. Volume 1: Saddle magnet design, construction and preliminary test results [AD-745321] p0249 N73-10247
- Lightweight superconducting MHD magnets. Volume 2: 10 MW level magnet system design and projections for future development [AD-745322] p0250 N73-11717
- Development of pulsed high energy inductive energy storage systems, Volume 1 [AD-755359] p0267 N73-23014
- Development of pulsed high energy inductive energy storage systems. Volume 3: Weight optimization for energy storage, coil, cryogen and dewar [AD-755360] p0267 N73-26054
- THOMPSON, D. M.
Identification and mapping of coal refuse banks and other targets in the anthracite region [PAPER-L24] p0110 N73-28319
- Mapping of anthracite refuse [E73-11107] p0112 N73-33264
- THOMPSON, M. A.
Fluoride volatility Conference proceedings [CONF-680610] p0087 N69-37355
- THORNTON, J. A.
The diagnostics of plasmas p0196 N68-17809
- THRING, M. W.
Power generation for aircraft in the second century. p0071 A68-43667
- M.H.D. research - Present and future. p0146 A69-24469
- A combustion oscillator for MHD energy conversion p0175 A71-38099
- TIKHONOV, B. A.
Investigation of supersonic radial nozzles for MHD-generators [FTD-MT-24-208-67] p0206 N68-35663
- TILFORD, J. H.
Fast reactor blanket management p0086 N69-31987
- TILLMAN, E. S., JR.
Hydrogen generator assemblies [AD-733931] p0118 N72-18520
- TITEICA, R.
Physical phenomena in magnetohydrodynamic generators p0163 A70-14716
- TITTERINGTON, W. A.
Electrolytic hydrogen fuel production with solid polymer electrolyte technology. p0116 A73-38413
- TOLMACH, I. H.
Investigation of a liquid-metal induction MHD generator p0151 A69-27513
- Spatial effects in MHD channels with segmented electrodes [SM-74/248] p0213 N69-13352
- TOLUBINSKIY, V. I.
Mining thermophysics p0089 N70-16584
- TOLZTCH, I.
Aircraft of the future p0076 A73-23682
- TORELLI, A. D.
Parametric study of space power systems. Volume 2 - Technical report Final report [NASA-CR-73280] p0214 N69-14760
- TORKILDSEN, R.
1 KVA three-phase DC-AC inverter with digital control. p0162 A69-42294
- TOSCHI, R.
Closed cycle M.H.D. experiments with a large blow-down facility. p0127 A68-23929
- Status of the research on closed cycle MHD power generation [RT/ING-(71)20] p0250 N73-12784
- TOTTEN, R. C.
Future cost of liquid hydrogen for use as an aircraft fuel. p0001 A68-33457
- TOUCHAIS, H.
New heliotechnique p0069 N73-33763
- TOURE, Y.
Self-contained submergeable energy sources p0183 A73-22203
- TOWNSEND, S. J.
Operation of an MHD power generator Concluding report, 1 Jun. - 30 Nov. 1967 [NASA-CR-72477] p0208 N69-12307

- Design and construction of a 3-MW magnetogasdynamic power generation facility at the University of Toronto Institute of Aerospace Studies
p0216 N69-18447
- TREBLE, F. C.**
Large solar array development in U.K.
p0028 A69-35707
Progress in advanced solar array development
p0034 A71-16099
Status report on RAE advanced solar array development.
p0041 A73-14237
Recent developments in silicon solar cells
p0050 N68-28741
The ion engine and large solar array for the X-5 spacecraft
[RAE-TR-68191]
p0054 N69-24137
Large solar array development in UK
[RAE-TR-69007]
p0060 N71-11063
Status report on RAE advanced solar array development
[RAE-TR-72109]
p0067 N73-21959
- TREBER, G. J.**
The contribution of space-charge in slender channel electrogasdynamics
p0165 A70-25036
EGD energy converter geometry studies
p0167 A70-30536
One-dimensional particulate electrogasdynamics
p0170 A70-40257
- TRIPET, J.**
Summary of six years of converter tests in the laboratory
p0180 A72-36139
- TROCHERIS, E.**
High temperature plasmas and controlled fusion
p0132 A68-38740
- TROMBE, P.**
Limitations of solar collectors for converters [AGARDGRAPH 81]
p0024 A68-22525
Limitations of solar collectors for converters
p0047 N68-17804
- TRUSHEVSKII, S. N.**
Investigations of high-temperature solar energy absorbers and thermal storage devices.
p0030 A70-10764
- TSCHULENA, G. R.**
A model of a thermophotovoltaic radionuclide battery.
p0185 A73-23279
- TSVETKOV, A. I.**
Performance reliability calculation for a solar thermoelectric generator module
p0036 A71-31672
- TSYRULNIKOV, A. S.**
Pressure effects on filtration of a heat carrier in earth core rocks
p0090 N70-16589
- TUCK, J. L.**
Energy sources of the future with emphasis on the light elements
[LA-DC-9519]
p0010 N68-28181
- TURNER, G. E.**
Operating characteristics of the primary flow loop of a conceptual nuclear Brayton space powerplant [NASA-TM-X-2161]
p0240 N71-18866
- TYREE, D. M.**
Naval surface ship Arctic missions. Volume 2, appendix A - Arctic resources
[AD-716415]
p0094 N71-19770
- U**
- UCHIDA, N.**
Electrode voltage drop in a seeded plasma.
p0128 A68-24872
- ULBER, E.**
Experimental results with a liquid-metal MHD induction converter.
p0151 A69-27509
- ULINICH, F. R.**
Investigation of a liquid-metal jet MHD generator
p0151 A69-27511
Qualitative analysis of MHD energy conversion efficiency
p0186 A73-27321
- ULMANIS, L. YA.**
Electromagnetic processes in an ideal, induction MHD machine
p0194 N68-16288
- UNAROV, G. IA.**
Calculation of the solar radiation incident on an inclined ribbed surface
p0040 A72-43194
- UNAROV, G. Y.**
Double-mirror solar energy concentrators using nickel parabolic reflectors
[AD-741880]
p0064 N72-29046
- UNOTO, J.**
Optimization theory of Hall MHD generator duct
p0172 A71-23441
- UNGURIANU, G. I.**
Solar elements based on heterojunctions of p-type GaAs/1-xP/x/ and n-type GaAs
p0039 A72-30225
- URBACH, H. B.**
Optimizing power efficiency of hydrazine-oxygen fuel cells.
p0187 A73-29598
High power density hydrazine fuel cells.
p0188 A73-38398
High-power density hydrazine fuel cells
[AD-764530]
p0255 N73-33009
- URBANIEC, K.**
The influence of collector temperature on the maximum efficiency of a thermionic converter in the series battery.
p0025 A68-43817
The maximum attainable efficiency of thermionic converters.
p0181 A72-36192
- URR, R. W., JR.**
Practical limits to the thermoelectric figure of merit. II.
p0179 A72-27722
- URUSOV, I. D.**
The problem of determining the dimensions of an MHD channel
[SE-74/242]
p0213 N69-13350
- URUSOV, L. D.**
Series of no-contact synchronous generators with outputs up to 100 kV for wind driven electric units
[AD-742641]
p0101 N72-31082
- USIK, I. F.**
A method for determining the economic effectiveness of gas turbine unit systems with the consideration of optimum parameters
[AD-683130]
p0013 N69-26227
- V**
- VALDMANIS, IA. IA.**
Electromagnetic calculation of an approximate model of an induction MHD machine with allowance for a secondary circuit
p0130 A68-29186
- VALDMANIS, YA. YA.**
Longitudinal edge effect in linear induction MHD machines
p0194 N68-16291
- VALENTIJN, H. P.**
Roll-up solar array Patent
[NASA-CASE-NPO-10188]
p0061 N71-20273
- VALERINO, A. S.**
Performance of a Brayton-cycle power conversion system using a helium-xenon gas mixture
p0175 A71-38908
- VALLI, F.**
Physical problems connected with the study of electromagnetic energy, particularly of the sun
p0025 A68-40644
- VAN ALLEN, L. C.**
Naval surface ship Arctic missions. Volume 2, appendix A - Arctic resources
[AD-716415]
p0094 N71-19770
- VAN ATTA, C. N.**
Status of controlled thermonuclear research.
p0123 A68-20598
- VAN LIERDE, N.**
State of development of an actinium fueled thermionic generator.
p0075 A72-36169

PERSONAL AUTHOR INDEX

WALD, F.

VAN OSDOL, J. R.
Nuclear power system study. p0184 A73-22799
Unmanned reactor-thermoelectric systems for applications in the 1970's. p0186 A73-26024

VAN WILLIGEN, J.
Reforming of gaseous hydrocarbons into town gas [NASA-TT-P-13668] p0095 B71-28159

VANIN, V. E.
Experimental investigation of the characteristics of a nonequilibrium MHD generator p0190 A73-39618

VARY, A.
Triode thermionic energy converter [NASA-CASE-XLE-01015] p0225 B69-39898

VASILEV, A. H.
Optical characteristics of silicon photocells and the efficiency of a thermal photoelectric converter p0023 A68-18489
Optical characteristics of silicon photocells and the efficiency of a thermophotovoltaic converter. p0025 A68-39356

VASILEV, L. G.
Magnetohydrodynamics in marine engineering [AD-706643] p0237 N70-38631

VASILEV, V. F.
Experimental investigation of liquid-metal MHD generators p0151 A69-27512

VAVASSEUR, C.
Experimental results of MHD conversion using a rare gas p0144 A69-23475

VAVILOV, B. I.
Thermal activity of the Uson Caldera based on infrared and photographic aerial survey. p0077 A73-39895

VEEPKIND, A.
Conducting grids to stabilized MHD generator plasmas against ionization instabilities [TH-72-E-31] p0253 N73-23757

VEILLETTE, L. J.
Highlights of a brushless direct-drive solar array control system design p0035 A71-27432

VERDERESE, A. J.
Modern control techniques applied to energy conservation flight control systems. p0263 A73-38415

VERDIEV, M. G.
Utilization of thermosiphons in the construction of thermoelectric devices p0187 A73-30950

VERNON, R. W.
Performance of the electrically-heated 2 to 15 kwe Brayton power system p0173 A71-32212
Experimental performance of a 2-15 kilowatt Brayton power system in the Space Power Facility using krypton [NASA-TM-X-52750] p0229 N70-19190

VESELOVSKIY, L. N.
The basic principles for optimum shielding of nuclear apparatus onboard spacecraft p0224 B69-38756

VESSELMAN, S. G.
Gasification of coal enrichment wastes p0116 N70-10884

VEZE, A. K.
Electromagnetic processes in an ideal, induction MHD machine p0194 B68-16288

VIC, R.
Autonomous hydrogen/air fuel cell for long-life missions. p0184 A73-22752

VIELSTICH, W.
Fuel cells- Modern processes for the electrochemical productions of energy p0171 A71-11192

VILNITIS, A. YA.
Transverse edge effect in plane induction magnetohydrodynamic machines p0194 B68-16290

VINEYARD, R. A.
Development and fabrication of lithium- diffused silicon solar cells Final report, 18 Aug. - 31 Jan. 1968 [NASA-CR-97077] p0051 B68-35814

VLADIMIROVA, L. H.
Applications of selective coatings in solar thermoelectric generators. p0031 A70-10767

VOGEL, G. J.
Work plan for continuation of the project reduction of atmospheric pollution by the application of fluidized bed combustion [ANL/ES-CR-1003] p0096 B71-36736

VOIGT, H.
Principles of steel construction engineering in the building and operation of wind driven power plants [NASA-TT-P-14872] p0106 B73-21253

VOINOV, A. H.
Investigation of the peculiarities of pre-flame processes and ignition of hydrocarbons of various structures. Part 1 - Variation of cool flame delay and ignition delay with compression temperature and pressure p0080 B68-19175

VOLCHKOV, V. K.
Series of no-contact synchronous generators with outputs up to 100 kv for wind driven electric units [AD-742641] p0101 N72-31082

VOLF, M. F.
Chemical stabilization of engine and jet fuels p0073 A71-17433

VOLKOV, Y. H.
Influence of boundary layers on the electrical characteristics of MHD generators [AD-745245] p0249 B72-33063

VOLLMEYER, R.
Nonlinear dynamic model of power plants with single-phase coolant reactors [AE-341] p0217 B69-21373

VON OHAIN, H.
Potentialities of direct electro-fluid dynamic energy conversion processes for power generation. [AGARDOGRAPH 81] p0124 A68-2253A
Electrofluid dynamic energy conversion - Present status and research areas [ASME PAPER 70-ENER-A] p0171 A71-13704
Potentialities of direct electro-fluid dynamic energy conversion processes for power generation, part A p0197 B68-17814

VOROB'EV, O. S.
Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity p0185 A73-23473

VOYENTZIE, P. R.
Optimization of design parameters for spacecraft nickel-cadmium cells containing recombination and control electrodes Quarterly report, Aug. - Oct. 1968 [NASA-CR-100813] p0265 B69-24894

VRANCIK, J. E.
Experimental evaluation of the electrical subsystem of the 2-to-15 kW Brayton power conversion system p0175 A71-38910

VULIS, L. A.
One-dimensional flow of a plasma in a MHD energy converter channel. p0126 A68-23796
Mercury flow with a hydraulic shock in a channel situated in a transverse magnetic field p0149 A69-27499

W

WACHTEL, W. W.
SNAP 29 heat source design and development. p0137 A68-42528

WALD, F.
Materials research problems in the direct conversion of thermal radiative and chemical energy into electricity. p0133 A68-41217

- Materials research problems in the direct conversion of thermal radiative and chemical energy into electricity. p0140 A69-11801
- WALDIE, B.**
Experimental and theoretical studies of gaseous suspensions of thermionic emitting particles for use as MHD working fluids. p0146 A69-23491
- WALDROW, H. B.**
Potential applications of nuclear explosives to the recovery of geothermal energy Progress report for fiscal year 1965 [USGS-289-1] p0088 N70-12921
- WALTER, C. E.**
Conceptual design of a 10-MW sub e nuclear Rankine system for space power [UCRL-50382] p0205 N68-30760
- WALTKE, G.**
Induction phenomena in MHD converters with constant and travelling magnetic field. p0147 A69-25399
- WANG, T. C.**
MHD induction generator. p0138 A68-43067
- WARD, J. J.**
Parametric analysis of radioisotope cascaded thermoelectric generators [NASA-TM-X-1501] p0192 N68-14585
Parametric analysis of radioisotope thermoelectric generators [NASA-TM-X-1453] p0193 N68-14630
Direct energy conversion p0208 N69-12585
- WARDER, R. C., JR.**
The diagnostics of plasmas p0196 N68-17809
- WARREN, W. R.**
Active cooling of a hydrogen fueled scramjet engine. [AIAA PAPER 68-1091] p0072 A68-44975
Active cooling of a hydrogen-fueled scramjet engine. [AIAA PAPER 68-1091] p0115 A69-43725
- WARRNER, C.**
Basic research in thermionic energy conversion Technical summary report, 1 Aug. 1968 - 30 Nov. 1969 [AD-700945] p0232 N70-26947
- WARNOCK, D. R.**
Megawatt fuel cells for aerospace applications. p0045 A73-29597
- WARREN, A. C.**
Replenishment of electrodes for MHD power generation p0166 A70-30535
- WARSAWSKI, B.**
Self-regenerating molten-lead electrodes for magnetohydrodynamic power generators. p0178 A72-18336
- WASHBURN, T. W.**
Fabrication and irradiation behavior of uranium mononitride. p0074 A72-22406
Comparative evaluation of sol-gel fuel fabrication costs [ORNL-TM-1979] p0078 N68-12553
- WATERS, H. H.**
Hypersonic transports - Economics and environmental effects. p0009 A73-34435
- WATROUS, J. D.**
Compatibility of the MHW-RTG heat source materials. p0076 A73-38427
- WATSON, D. C.**
Investigation of synchronous-wave RF to dc conversion Final report, 1 Jun. 1966 - 31 Dec. 1967 [BEPT.-4] p0205 N68-30681
- WATSON, R. G. H.**
Fuel cell reactant properties. [AGARDOGRAPH 81] p0125 A68-22541
Fuel cell reactant properties p0198 N68-17821
- WATTENDORP, F.**
Potentialities of direct electro-fluid dynamic energy conversion processes for power generation. [AGARDOGRAPH 81] p0124 A68-22534
Potentialities of direct electro-fluid dynamic energy conversion processes for power generation, part A p0197 N68-17814
- Selected topics in electrofluid dynamic energy conversion [AGARDOGRAPH-122] p0215 N69-18439
- WAY, S.**
Exploring a closed Brayton cycle MHD power system applying NERVA reactor technology [AIAA PAPER 70-1225] p0170 A70-45956
- WEAR, J. D.**
Comparison of ASTM-A1 and natural gas fuels in an annular turbojet combustor [NASA-TM-X-52700] p0087 N70-12102
Comparison of combustion characteristics of ASTM A-1, propane, and natural-gas fuels in an annular turbojet combustor [NASA-TM-D-7135] p0104 N73-16771
- WEBB, R. G.**
Development status of solar generators based on silicon photovoltaic cells p0050 N68-28740
- WEBER, R. J.**
A review of the potential of liquid-methane fuel for supersonic transports. p0072 A68-44446
Preliminary appraisal of hydrogen and methane fuel in a Mach 2.7 supersonic transport [NASA-TM-X-68222] p0020 N73-22711
- WEBSTER, D. S.**
Development of high-specific-energy batteries for electric vehicles [ANL-7953] p0267 N73-19061
Lithium/sulfur batteries for off-peak energy storage: A preliminary comparison of energy storage and peak power generation systems [ANL-7958] p0268 N73-30058
- WEB, H.**
Induction phenomena in MHD converters with constant and travelling magnetic field. p0147 A69-25399
Cylindrically constructed MHD induction converters. p0150 A69-27505
- WEHNER, H.**
Advances in organic geochemistry 1971: Proceedings of the Fifth International Meeting, Hanover, West Germany, September 7-10, 1971. p0076 A73-25459
- WEIGAND, A. J.**
Solar absorptances and spectral reflectances of 12 metals for temperatures ranging from 300 to 500 K [NASA-TM-D-5353] p0055 N69-31895
- WEIKEL, R. C.**
Large area solar array Quarterly report - Phase 2, 1 Mar. - 31 May 1968 [NASA-CR-95999] p0051 N68-31404
- WEIKEL, T. D.**
Ground support equipment: Low pollutant fuels [AD-755151] p0196 N73-20815
- WEIL, J. C.**
Effective stack heights for tall stacks [FHL-PUBL-71-14] p0098 N72-16934
- WEINSTEIN, M.**
Materials research problems in the direct conversion of thermal radiative and chemical energy into electricity. p0133 A68-41217
Materials research problems in the direct conversion of thermal radiative and chemical energy into electricity. p0140 A69-11801
- WEISS, K.**
Research in energy conversion Final report, 1 Oct. 1963 - 30 Sep. 1966 [AFCLR-67-0512] p0200 N68-21051
- WEISS, S.**
The use of hydrogen for aircraft propulsion in view of the fuel crisis. p0009 A73-35469
The use of hydrogen for aircraft propulsion in view of the fuel crisis [NASA-TM-X-68242] p0021 N73-24777
- WELFARE, F. G.**
Physics, thermal hydraulic, and fuel cycle cost analyses of a metallic uranium direct replacement for PWR'S [ORNL-TM-2493] p0188 N70-12423
- WELLING, C. E.**
Thermally activated foaming compositions Patent [NASA-CASE-IAR-10373-1] p0062 N71-26155

PERSONAL AUTHOR INDEX

WILSON, R. F.

- WELLS, T. L.
Relevance of ERTS-1 to the state of Ohio
[E73-100321] p0104 N73-15365
Resource management implications of ERTS-1 data to Ohio
[PAPER-R3] p0110 N73-28361
- WERBEL, J.
Air Force Advanced Solar Turbo Electric Concept.
p0023 A68-20595
- WERNER, R. W.
Controlled thermonuclear power
[UCRL-71500] p0226 N70-12638
- WESSEL, W. R.
Direct current MHD generators with variable conductivity, velocity, and magnetic field.
p0157 A69-39027
- WEST, L. R.
Explosive magnetohydrodynamic program
[AD-762934] p0254 N73-30890
- WHALLON, R. D.
Economic analysis of the use of gelled fuels in jet transport aircraft Final report
[FAA-NA-70-45] p0093 N70-34002
- WHITE, D. C.
P-i-n structures for controlled spectrum photovoltaic converters.
[AGARDOGRAPH 81] p0126 A68-22549
P-i-n structures for controlled spectrum photovoltaic converters
p0199 N68-17830
- WHITE, R. P.
Review and evaluation of Project Fuel Cell
[OCR-17] p0192 N68-12477
- WHITING, G.
Thermoelectric devices - For space and remote terrestrial sites
p0167 A70-39225
- WHITLOW, J. R., JR.
Preliminary appraisal of hydrogen and methane fuel in a Mach 2.7 supersonic transport
[NASA-TN-1-68222] p0020 N73-22711
- WHITHAMSH, C. L., JR.
Reactivity effects caused by radial power flattening in a small, fast-spectrum reactor
[NASA-TN-D-4459] p0080 N68-19925
- WHITSON, M. O.
Controlled fusion and plasma research: A literature search
[TID-3557-1971-SUPPL] p0250 N73-12785
- WICK, H. R., JR.
A design for thick film microcircuit dc-to-dc converter electronics
p0173 A71-30801
- WICKENBERG, E.
Deep sea radioisotope-fueled thermoelectric generator power supply system. SNAP-21 program, phase 2 - 10-watt system Final summary report
[MMN-3691-62] p0239 N71-15039
- WIENECKE, B.
Some diagnostic techniques useful for MHD-generator plasmas.
p0133 A68-39726
- WIENER, F.
Concept for a high voltage solar array with integral power conditioning.
p0044 A73-26001
- WIENER, R. W.
Research in energy conversion Final report, 1 Oct. 1963 - 30 Sep. 1966
[AFCLR-67-0512] p0200 N68-21051
- WIER, C.
Study of application of ERTS-1 imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10064] p0102 N72-32336
- WIER, C. E.
Study of the application of ERTS-1 imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10193] p0102 N73-10372
Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10096] p0105 N73-18321
Study of application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10371] p0105 N73-19366
- Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10776] p0108 N73-27252
Application of EREP imagery to fracture related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277
Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-10970] p0111 N73-30311
Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-11034] p0112 N73-31338
- WIESNER, W.
The catalytic effectiveness of nickel and nickel boride for anodic hydrazine oxidation on porous carbon electrodes
p0164 A70-24469
- WILCOX, D. E.
Future cost of liquid hydrogen for use as an aircraft fuel.
p0001 A68-33457
- WILCOX, R. M.
Microwave radiometric detection of oil slicks
[AD-728551] p0098 N72-14402
- WILKINS, D. R.
A unified theoretical description of thermionic converter performance characteristics.
p0130 A68-29729
- WILLCUTT, G. J. E., JR.
Thermal steady-state characterization of isotope radioisotope thermoelectric generator
[ASME PAPER 69-WA/ENER-12] p0163 A70-14897
- WILLIAMS, D. C.
Transit analysis
[SC-RR-69-662] p0091 N70-21251
- WILLIAMS, D. P.
Microwave radiometric detection of oil slicks
[AD-728551] p0098 N72-14402
- WILLIAMS, E. W.
Development of a 100 watt/e/ isotope thermionic electrical power module.
p0155 A69-29190
- WILLIAMS, H. L.
Reliability techniques in the petroleum industry
p0100 N72-25986
- WILLIAMS, J. R.
Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829
Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411
The Satellite Nuclear Power Station - An option for future power generation.
p0189 A73-38412
Gas core reactors for MHD power systems
p0243 N71-33664
Power plant systems analysis
p0253 N73-28657
- WILLIAMS, R. S., JR.
Geological analysis of aerial thermography of the Canary Islands, Spain.
p0077 A73-39896
Satellite geological and geophysical remote sensing of Iceland
[E73-10874] p0111 N73-29225
- WILLIS, C. E.
Calorimetric, optical, and vibration investigations of stretch-formed aluminum solar concentrators
[NASA-TN-D-4889] p0052 N69-10708
Calorimetric evaluation of two cone-column solar-energy concentrators
[NASA-TN-D-5109] p0053 N69-21088
- WILSON, A. J.
Advanced Rankine cycle provides basic technology for other powerplants as well
p0163 A70-12513
- WILSON, D. M.
17alpha/H/ hopane identified in oil shale of the Green River formation /Eocene/ by carbon-13 NMR.
p0076 A73-29734
- WILSON, R. F.
Nuclear power system study.
p0184 A73-22799

- WILSON, T. G.
Regulated dc to dc converter for voltage step-up
or step-down with input-output isolation
[NASA-CASE-HQN-10792-1] p0248 N72-27230
- WILSON, T. L.
Development of high-specific-energy batteries for
electric vehicles
[ANL-7953] p0267 N73-19061
- WILSON, V. C.
Output performance of a thermionic converter with
an oriented tungsten /110/ emitter and a
polycrystalline tungsten collector.
p0180 A72-34604
Characteristics of a thermionic converter with a
chloride vapor deposited tungsten emitter /110/
and a nickel collector
[NASA-CR-1416] p0222 N69-32553
- WIPP, S. L.
Superconductive energy storage
[NASA-TT-P-15109] p0268 N73-31676
- WISE, J. F.
Solar energy conversion development relative to
Department of Defense space power requirements.
p0044 A73-29595
- WISE, E. R.
Phoenix fuel evaluation in a maritime reactor design
[BNWL-851] p0082 N69-15543
- WITALIS, E.
Electrical power production by means of MHD,
present situation and future prospects
[FOA-4-C-4325-55] p0223 N69-35224
- WITCOPSKI, R. D.
Potentials and problems of hydrogen fueled
supersonic and hypersonic aircraft.
p0009 A73-22830
- WITKOWSKI, S.
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
MHD generator in two-terminal operation.
p0132 A68-39717
- WIZENICK, R.
Planetary solar array development Quarterly report
[NASA-CR-91730] p0046 N68-14185
- WOBBER, F. J.
Put geology surveys in orbit to find oil.
p0071 A68-30437
Study of application of ERTS-1 imagery to
fracture-related mine safety hazards in the coal
mining industry
[E72-10064] p0102 N72-32336
Study of the application of ERTS-A imagery to
fracture-related mine safety hazards in the coal
mining industry
[E72-10193] p0102 N73-10372
Application of ERTS-A imagery to fracture related
mine safety hazards in the coal mining industry
[E73-10296] p0105 N73-18321
Study of application of ERTS-A imagery to fracture
related mine safety hazards in the coal mining
industry
[E73-10371] p0105 N73-19366
Application of ERTS-A imagery to fracture related
mine safety hazards in the coal mining industry
[E73-10776] p0108 N73-27252
Application of EREP imagery to fracture related
mine safety hazards and environmental problems
in mining
[E73-10802] p0109 N73-27277
Study of application of ERTS-A imagery to
fracture-related mine safety hazards in the coal
mining industry
[E73-10970] p0111 N73-30311
Study of application of ERTS-A imagery to
fracture-related mine safety hazards in the coal
mining industry
[E73-11034] p0112 N73-31338
- WOLF, E.
Power limitation of an incore thermionic cell
p0172 A71-25894
- WOLF, H.
A new look at silicon solar cell performance
p0035 A71-16104
A new look at silicon solar cell performance
p0036 A71-29702
The 'Silicon Solar Cell Design Handbook.'
p0040 A73-14209
Cost goals for silicon solar arrays for large
scale terrestrial applications.
p0041 A73-14250
- Historical development of solar cells.
p0044 A73-29594
Review and evaluation of past solar cell
development efforts Semiannual report, Jun. 1 -
Nov. 30, 1967
[NASA-CR-92679] p0047 N68-16882
Research for the improvement of silicon solar cell
efficiency
[NASA-CR-121751] p0062 N71-34042
- WOLFF, H. J.
The fundamentals of improved silicon solar-cell
performance
p0064 N72-27059
- WOLFE, R. A.
Criticality analysis of the large heat source
system containing plutonium 238 dioxide fuel
[MLM-1532] p0082 N69-15081
- WOLFF, G.
Oriented flexible rolled-up solar array
[AIAA PAPER 70-738] p0032 A70-25434
- WONACK, G. J.
MHD power generation- Engineering aspects
p0165 A70-25525
- WONG, H. Y.
A technique for determining the operational
characteristics of a thermoelectric module.
p0178 A72-27721
- WOOD, J. C.
Turbine performance in a gas-bearing Brayton cycle
turboalternator
[NASA-TN-D-5604] p0227 N70-14220
- WOODALL, J. B.
High-efficiency Ga/1-x/Al/x/As-GaAs solar cells.
p0040 A73-10132
- WOODCOCK, G. H.
On the economics of space utilization.
p0009 A72-05216
Feasibility of large-scale orbital solar/thermal
power generation.
p0046 A73-38404
- WOODWARD, W. H.
Future applications for static energy conversion
devices
p0203 N68-28748
An assessment of solar energy as a national energy
resource
[NASA-CR-133101] p0068 N73-26818
- WOODWELL, G. M.
Ecological effects of energy: A basis for policy
in regional planning
[BNL-16228] p0018 N72-20371
- WORK, E.
Further infrared systems studies for the earth
resources program Final report
[NASA-CR-102111] p0089 N70-16407
- WRIGHT, L. E.
Operation of a 20 Mw Hall generator.
p0127 A69-23919
- WRIGHT, W. A.
An improved viscosity-temperature chart for
hydrocarbons.
p0072 A69-23975
- WROBLOWA, H.
Electrochemical catalysis.
[AGARDOGRAPH 81] p0261 A68-22542
Electrochemical catalysis
p0199 N68-17823
- WU, Y. C. L.
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
MHD generator in two-terminal operation.
p0132 A68-39717
The performance of a family of diagonal conducting
wall MHD open cycle generators
p0169 A70-00000
Current distribution of a segmented Hall generator
[AD-705160] p0234 N70-32778
The performance of a family of diagonal conducting
wall MHD open cycle generators
[AD-705159] p0235 N70-32986
Fluctuations in series connected open cycle MHD
generators
[AD-721454] p0242 N71-28680
Factors effecting the performance of diagonal
conducting wall open cycle MHD generators
[AD-721455] p0242 N71-28718

- VUKELIC, G. E.**
Relevance of ERTS-1 to the state of Ohio
[E73-10032] p0104 N73-15365
Resource management implications of ERTS-1 data to Ohio
[PAPER-R3] p0110 N73-28361
- WERN, J. G.**
Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-4243.F] p0085 N69-31119

Y

- YAKIMOVICH, K. A.**
Thermodynamics of a two-component liquid metal MHD power plant with an injector
[SM-74/218] p0212 N69-13335
- YAKUBENKO, A. YE.**
Calculation of the boundary layer at the electrode of a plane MHD generator
p0219 N69-26243
- YANG, Y. Y.**
Exploratory study of several advanced nuclear-MHD power plant systems.
p0189 A73-38411
Power plant systems analysis
p0253 N73-28657
- YASUI, R. K.**
Solar cell submodule Patent
[NASA-CASE-MNP-05821] p0060 N71-11056
- YEAGER, E.**
Kinetic factors in fuel cell systems - The oxygen electrode
p0199 N68-17824
- YEAGER, P. B.**
Solar energy research. A multidisciplinary approach
p0066 N73-14812
- YEN, J. T.**
Clean and attractive urban power systems
[RE-439J] p0253 N73-22912
- YOSHII, G.**
Research on radioactive dust in the air at KUR operation
[KURRI-TR-56] p0091 N70-21010
- YOSHIMAWA, S.**
Consideration of power requirement in fusion feasibility experiment
[MATT-803] p0246 N72-11641
- YOUNG, R. W.**
A power and load priority control concept as applied to a Brayton cycle turbo-electric generator.
p0186 A73-25984
Power and load priority control concept for a Brayton cycle power system
[NASA-TN-D-6478] p0244 N71-36452
- YOUNG, W. C.**
Feasibility study 30 watts per pound roll-up solar array Final report
[NASA-CR-96230] p0051 N68-32561
- YUNG, Y. I.**
Exploratory investigation of an electric power plant utilizing a gaseous core reactor with MHD conversion.
p0184 A73-22829

Z

- ZAKHARENKO, V. D.**
Theoretical possibility of converting the kinetic energy of an ionized gas flow into electricity
p0185 A73-23473
- ZAKHIDOV, R. A.**
Computation and optimization of the thermal regime in concentrator-type solar devices.
p0026 A69-22534
Thermal conditions in cylindrical cavity absorbers of high-temperature solar energy converters.
p0030 A70-10761
Energy economics prognostication for the prospects of solar radiation utilization
p0037 A72-24316

- ZAKIROVA, V. N.**
Double-mirror solar energy concentrators using nickel parabolic reflectors
[AD-741880] p0064 N72-29046
- ZAKLIZHINSKII, L. A.**
Design of an MHD generator with an electric conductivity waveform at small magnetic Reynolds numbers
p0156 A69-29911
- ZANPAGLIONE, V.**
Effective conductivity of an MHD plasma in a turbulent state.
p0184 A69-23460
Influence of ionization turbulence on the performance of nonequilibrium plasma MHD generators.
p0179 A72-29354
Status of the research on closed cycle MHD power generation
[RT/ING-(71)20] p0250 N73-12784
- ZANANTONI, C.**
Can thorium compete with uranium? An assessment for heavy-water and graphite moderated reactors
[EUR-4264.E] p0085 N69-31081
- ZANNETOS, Z. S.**
Some problems and prospects for marine transportation of oil in the 1970s
[NASA-CR-133854] p0258 N73-30464
- ZAPOROWSKI, B.**
Investigation of optimal conditions for energy conversion in an MHD generator
p0177 A72-11207
- ZAREMBA, YE. L.**
A comparison of magnetic systems for producing strong large-volume fields
[AD-683989] p0219 N69-26189
- ZASLAVSKIY, V. V.**
Critical experiments with organic moderators - Monoisopropyl diphenyl and gas oil
[FTD-HT-66-746] p0079 N68-12884
- SAUDERER, B.**
Experimental study of nonequilibrium ionization in a linear MHD generator.
p0126 A68-23120
Electrical characteristics of a linear, nonequilibrium, MHD generator.
p0133 A68-39722
Performance of a large scale, non-equilibrium MHD generator with rare gases. II
p0169 A70-40012
Performance of a large scale, nonequilibrium MHD generator with rare gases
p0172 A71-29879
Electrode effects and gas dynamic characteristics of a large, non-equilibrium MHD generator with cesium seeded, noble gases.
p0179 A72-29356
- Investigation of a large scale non-equilibrium magnetohydrodynamic generator Annual report, 1 Aug. 1968 - 31 Jul. 1969**
[AD-693153] p0226 N70-11420
Performance of a large scale nonequilibrium MHD generator with rare gases
[AD-703314] p0234 N70-31999
Optimization of a linear non-equilibrium MHD generator
[AD-707803] p0237 N70-40031
Investigation of a large scale nonequilibrium magnetohydrodynamic generator Annual report, 1 Aug. 1969 - 31 Jul. 1970
[AD-711351] p0238 N71-10992
Experiments in a large, non-equilibrium MHD generator with cesium seeded, noble gases and heated electrodes
[AD-719381] p0241 N71-24680
Investigation of a large scale nonequilibrium magnetohydrodynamic generator
[AD-728407] p0246 N72-13211
Investigation of a non-equilibrium magnetohydrodynamic generator
[AD-747661] p0250 N73-12068
- ZENKEVICH, V. B.**
Pulse MHD generator with a superconducting magnetic system
p0120 A68-16523
A pulsed magnetohydrodynamic generator with a superconducting magnetic system.
p0131 A68-30774

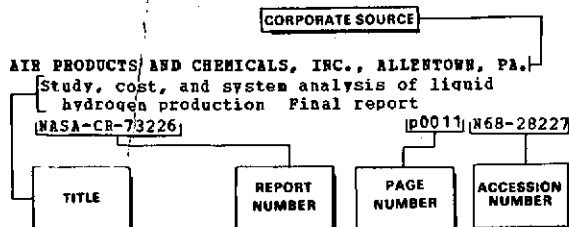
- Superconductors in marine technology
[AD-755711] p0252 N73-22702
- ERLAUT, G. A.
Thermal control materials and technology in the
1970's.
[ASME PAPER 73-ENAS-7] p0045 A73-37969
- ETTFMOOG, P.
Experimental results of MHD conversion using a
rare gas
p0144 A69-23475
- ZGORZELSKI, M.
The influence of collector temperature on the
maximum efficiency of a thermionic converter in
the series battery.
p0025 A68-43817
- ZHIERIN, D. G.
The ENIN-2 experimental open-cycle MHD generator rig
[AD-683131] p0220 N69-27397
The ENIN-2 experimental open cycle MHD generator rig
[AD-751251] p0251 N73-16036
- ZHUKOVA, V. N.
Some properties of photoconverters based on
compressed sintered tablets /CST/ of CdS
p0036 A71-44390
- ZHUSAVLENKO, V. YA.
Practical application of underground heat sources
p0089 N70-16585
- ZIFFERO, M.
Sol-gel research and development in Italy
[RT/CHI/68/28] p0082 N69-11048
- ZILBERSSTEIN, L. A.
Series of no-contact synchronous generators with
outputs up to 100 kV for wind driven electric
units
[AD-742641] p0101 N72-31082
- ZIMIN, B. P.
Experimental investigation of electrical
conductivity of products of combustion,
stimulated by solid particles
[AD-685511] p0222 N69-29923
- ZIMMERMAN, E. P.
Development of an integrated lightweight flexible
silicon solar cell array Quarterly technical
report, 1 Jul. - 1 Oct. 1969
[NASA-CR-106379] p0056 N69-40952
Development of an integrated lightweight flexible
silicon solar cell array Quarterly technical
report, 1 Jan. - 1 Apr. 1970
[NASA-CR-109527] p0057 N70-25500
Development of an integrated lightweight flexible
silicon solar cell array Final report
[NASA-CR-110913] p0059 N70-43081
- ZINKO, B.
Calculation of gas parameters in MHD generators
[IPP-3/97] p0230 N70-21895
- ZITEN, C. B.
Utility requirements in fast breeders
p0087 N69-35243
- ZITZOW, U.
Two-terminal connected open cycle MHD generators.
p0127 A68-23920
MHD generator in two-terminal operation.
p0132 A68-39717
- ZOTOVA, E. A.
Investigation of a liquid-metal jet MHD generator
p0151 A69-27511
- ZRAKST, C. A.
Energy, resources and the environment
[PB-213031] p0020 N73-26820
- ZVONOV, N. V.
Critical experiments with organic moderators -
Monoisopropyl diphenyl and gas oil
[FTD-HT-66-746] p0079 N68-12884
- ZWICK, E. B.
Mechanical heat engines for space power systems
p0228 N70-16221
Alternators for space power applications
p0228 N70-16224
- ZWICKLER, S. A.
Ecological significance of waste heat utilization.
p0071 A68-21940

CORPORATE SOURCE INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Corporate Source Index Listing



Listings in this index are arranged alphabetically by corporate source. The title of the document is used to provide a brief description of the subject matter. The page number and NASA accession number are included in each entry to assist the user in locating the abstract in the abstract section. If applicable, a report number is also included as an aid in identifying the document.

A

ACADEMY OF SCIENCES (USSR), MOSCOW.

Hq and Cs as working media for studies of certain properties of MHD generators working in a Rankine cycle
[SM-107/130] p0214 N69-15430

Certain problems of the efficiency of power production in MHD generators with a nonequilibrium plasma
[IAE-1701] p0235 N70-33216

ADMIRALTY MATERIALS LAB., POOLE (ENGLAND).

Fuel cell reactant properties p0198 N68-17821

ADVISORY GROUP FOR AEROSPACE RESEARCH AND DEVELOPMENT, PARIS (FRANCE).

Combustion and propulsion p0195 N68-17793
[AGARDGRAPH-81]
High-temperature thermoelectric material limitations p0198 N68-17820

Performance forecast of selected static energy conversion devices
[AGARD-CP-21] p0203 N68-28714

Selected topics in electrofluid dynamic energy conversion p0215 N69-18439
[AGARDGRAPH-122]

Space power systems, part 1 Lecture series
[AGARDGRAPH-123-PT-1] p0228 N70-16217

Nuclear space power systems p0228 N70-16220

Mechanical heat engines for space power systems p0228 N70-16221

Alternators for space power applications p0228 N70-16224

Engineering aspects of thermionic energy conversion p0229 N70-16226

Photovoltaic devices and systems p0056 N70-16228

AEG-KERNENERGIEANLAGEN, HAMBURG (WEST GERMANY).

Systems considerations using fuel cells p0203 N68-28738

AEG-TELEFUNKEN, HAMBURG (WEST GERMANY).

The Helios solar cell generator
[DGLR-PAPER-72-091] p0066 N73-15084

AEROMET-GENERAL CORP., EL MONTE, CALIF.

A study of passive microwave techniques applied to geologic problems p0097 N72-12262

Microwave radiometric detection of oil slicks
[AD-728551] p0098 N72-14402

AERONAUTICAL CHART AND INFORMATION CENTER, ST. LOUIS, MO.

Data of gravimetric surveys and problems of direct search for oil and gas on the Monzhukly structure
[ACIC-TC-1217] p0078 N68-10240

AEROPROJECTS, INC., WEST CHESTER, PA.

Applications of ultrasonic energy - ultrasonic instrumentation for nuclear applications
Sixmonthly progress report, Jun. 1 - Jul. 31, 1967
[NYO-3622-10] p0190 N68-10758

AEROSPACE RESEARCH LABS., WRIGHT-PATTERSON AFB, OHIO.

The role of electrofluid dynamics in the field of direct energy conversion p0215 N69-18440

Electrofluid dynamic energy conversion processes characteristics and research areas p0215 N69-18441

Effects on electrode geometry similarity and scaling laws in EPD energy conversion processes. Part 1 - Fundamental considerations p0216 N69-18442

Working media for electrofluid dynamic generators p0216 N69-18444

Some analytical treatments of EPD processes p0216 N69-18445

AIR FORCE AERO PROPULSION LAB., WRIGHT-PATTERSON AFB, OHIO.

Power and energy for posterity p0019 N73-13864

Lithium-doped silicon solar cells state-of-the-art
[AD-764357] p0068 N73-30982

AIR FORCE SYSTEMS COMMAND, WRIGHT-PATTERSON AFB, OHIO.

The integral characteristics of a magnetohydrodynamic generator with two pairs of finite-length electrodes p0192 N68-11664

Critical experiments with organic moderators - Monoisopropyl diphenyl and gas oil
[FTD-HT-66-746] p0079 N68-12884

Status and perspectives of developing magnetohydrodynamics generators
[FTD-HT-66-378] p0192 N68-13094

Potentialities of direct electro-fluid dynamic energy conversion processes for power generation, part A p0197 N68-17814

Performance characteristics of electro-fluid dynamic energy conversion processes employing viscous coupling, part B p0198 N68-17815

Performance characteristics of electro-ballistic generators, part C p0198 N68-17816

Ion generation by corona discharge for electro-fluid energy conversion processes, part D p0198 N68-17817

Experimental techniques in electro-fluid dynamic energy conversion research, part E p0198 N68-17818

Direct comparison of various forms of energy into electric and mechanical power
[FTD-HT-64-355] p0203 N68-26786

Performance forecast of selected static energy conversion devices
[AGARD-CP-21] p0203 N68-28714

Regenerative fuel cells p0203 N68-28735

Parameters of magnetohydrodynamic /MHD/-generators taking into account ionization instability of plasma
[FTD-HT-24-295-67] p0206 N68-35442

- Investigation of supersonic radial nozzles for
MHD-generators
[PTD-MT-24-208-67] p0206 N68-35663
- International Symposium on Production of
Electric Power by Means of MHD Generators
/selected articles/
[AD-674611] p0012 N69-13314
- Studies of electrodes in an MHD generator
[SM-74/62] p0210 N69-13315
- A method of optimization of the constant current
electromagnet in an MHD generator
[SM-74/83] p0210 N69-13317
- Study of electrodes made refractory metals for
MHD generators utilizing nonequilibrium
conductivity
[SM-74/92] p0210 N69-13319
- Study of the nonequilibrium conductivity of a
plasma in an MHD generator
[SM-74/104] p0210 N69-13324
- Some results of experiments with a 100-kw MHD
generator model
[SM-74/212] p0210 N69-13325
- On the effectiveness of enriching air with
oxygen in installations with MHD generators
[SM-74/201] p0211 N69-13327
- The effect of the output on the thermal
efficiency in electric power stations using
MHD generators
[SM-74/204] p0211 N69-13329
- Experimental investigation of the
magnetohydrodynamic generator
[SM-74/206] p0211 N69-13331
- Experimental investigation of volt-ampere
characteristics of a magnetohydrodynamic
channel with different electrodes
[SM-74/209] p0211 N69-13332
- Electrical parameters of a synchronous
magnetohydrodynamic generator with pulsating
electrical conductivity of medium
[SM-74/210] p0211 N69-13333
- Composition and thermodynamic properties of the
combustion products of natural fuels with
ionizing additives
[SM-74/217] p0082 N69-13334
- Thermodynamics of a two-component liquid metal
MHD power plant with an injector
[SM-74/218] p0212 N69-13335
- Certain problems in the operation of a
installation with MHD generator
[SM-74/221] p0212 N69-13336
- Plasma flow in the duct of a "series" MHD
generator
[SM-74/225] p0212 N69-13339
- Transient processes in superconducting magnetic
systems
[SM-74/229] p0212 N69-13341
- Thermodynamic characteristics of high
temperature open cycles
[SM-74/235] p0212 N69-13345
- An experimental investigation of the electrical
conductivity of plasma in an MHD generator model
[SM-74/236] p0213 N69-13346
- Electrical arcs in ionized and non-ionized gas
streams
[SM-74/238] p0213 N69-13347
- On the applicability of electrodynamic
approximation in the theory of liquid metal
MHD energy converters
[SM-74/240] p0213 N69-13348
- The problem of determining the dimensions of an
MHD channel
[SM-74/242] p0213 N69-13350
- Spatial effects in MHD channels with segmented
electrodes
[SM-74/248] p0213 N69-13352
- Specialized computer for the calculation of
optimum parameters of technological processes
[AD-682791] p0084 N69-26099
- A comparison of magnetic systems for producing
strong large-volume fields
[AD-683989] p0219 N69-26189
- A method for determining the economic
effectiveness of gas turbine unit systems with
the consideration of optimum parameters
[AD-683130] p0013 N69-26227
- Second generation gas turbine engines.
Discussion of turbofan engines
[AD-683118] p0220 N69-26520
- Elements of the general theory of transient work
processes of liquid-metal MHD conduction type
generators
[AD-680712] p0220 N69-26620
- The ENIN-2 experimental open-cycle MHD generator
rig
[AD-683131] p0220 N69-27397
- Experimental investigation of the influence of
boundary layers and certain other effects on
the characteristics of an MHD generator
[AD-685536] p0221 N69-29842
- Optimum geometric relationships in a coaxial
linear induction and MHD generator
[AD-685523] p0221 N69-29843
- Rayleigh-Taylor instability in liquid-metal
synchronous MHD generators and methods of
stabilizing it
[AD-685487] p0221 N69-29892
- Energy sources in aircraft engines
[AD-685535] p0116 N69-29919
- Experimental investigation of electrical
conductivity of products of combustion,
stimulated by solid particles
[AD-685511] p0222 N69-29923
- The integral characteristics of an MHD generator
with diverging electrodes
[AD-694396] p0227 N70-13251
- Thermoelectric power supplies
[AD-690786] p0227 N70-13308
- Some characteristics of the protective effect of
petroleum-soluble corrosion inhibitors for
iron in the electrolyte-hydrocarbon two-phase
system
[AD-694781] p0258 N70-14391
- Certain design peculiarities of automotive gas
turbines
[AD-694842] p0227 N70-14488
- Physical and technical problems of direct
conversion of chemical energy into electrical
[AD-696497] p0229 N70-16341
- Petroleum products, properties, quality,
application, part 1
[AD-698440] p0092 N70-23046
- Petroleum products, properties, quality,
application, part 2
[AD-698546] p0092 N70-23047
- Petroleum products, properties, quality,
application, part 3
[AD-698547] p0092 N70-23048
- Petroleum products, properties, quality,
application, part 4
[AD-698548] p0092 N70-23049
- Plasma physics and problems of
magnetohydrodynamics in the transformation of
energy
[AD-699661] p0231 N70-25577
- High temperature solar furnace
[AD-704754] p0059 N70-32426
- Magnetohydrodynamic method of obtaining
electrical energy
[AD-705748] p0235 N70-34859
- Moscow. All-Union Scientific Research Institute
for Petroleum Refining. Transactions
[AD-700689] p0093 N70-35477
- Matching a thermionic converter with a solar
cell in a solar power array
[AD-704002] p0059 N70-36227
- International Symposium on Magnetohydrodynamic
Electrical Power Generation
[AD-703158] p0236 N70-36408
- MHD methods of obtaining electrical energy -
Annotation and preface
[AD-706160] p0236 N70-37628
- The energy sources of aviation engines
[AD-707178] p0016 N70-37672
- On the problem of constructing superconducting
magnetic systems for MHD-generators
[AD-706779] p0237 N70-37715
- Magnetohydrodynamics in marine engineering
[AD-706643] p0237 N70-38631
- Thermodynamic aspects of the problem of
immediate conversion of chemical energy into
electrical
[AD-713875] p0240 N71-16318
- Limit characteristics of an MHD generator with a
nonequilibrium plasma
[AD-726588] p0244 N71-37309

CORPORATE SOURCE INDEX

ARMY ELECTRONICS COMMAND.

- Prospects for the application of high temperature fuel cells
[AD-727497] p0244 N71-37624
- Measuring devices of a computer control system for automating heavy duty power units of a thermoelectric power station
[AD-727461] p0244 N71-38010
- Some questions of the effectiveness of the production of electroenergy in MHD-generator in a nonequilibrium plasma
[AD-724973] p0245 N72-10782
- Multimegawatt, pulsing, explosive driven MHD feasibility study
[AD-735660] p0247 N72-21497
- Influence of boundary layers on the electrical characteristics of MHD generators
[AD-745245] p0249 N72-33063
- The present and future of fuel cells
[AD-743651] p0249 N72-33065
- Principles of thermoelectronic and magnetohydrodynamic conversion of energy
[AD-748707] p0250 N73-13061
- The EWIN-2 experimental open cycle MHD generator rig
[AD-751251] p0251 N73-16036
- Hydraulics of magnetohydrodynamic machines
[AD-751465] p0252 N73-16718
- Analysis of thermal economy of combined power installations employing open-cycle MHD generators
[AD-753031] p0252 N73-18090
- Superconductors in marine technology
[AD-755711] p0252 N73-22702
- Magnetohydrodynamic generator for a combined magnetohydrodynamic electric power plant with a first generation open cycle
[AD-764925] p0254 N73-31996
- AIR PRODUCTS AND CHEMICALS, INC., ALLENTOWN, PA.**
Study, cost, and system analysis of liquid hydrogen production Final report
[NASA-CR-73226] p0011 N68-28227
- AIRESEARCH MFG. CO., LOS ANGELES, CALIF.**
Working gas selection for the closed Brayton cycle
[NASA-CR-108945] p0057 N70-20627
- Recuperator development program, solar Brayton cycle system Final design report
[NASA-CR-108945] p0057 N70-20627
- AKADEMIYA NAUK URSS, KIEV.**
Effect of electron screening on thermonuclear reactions under high densities
[ITP-69-7] p0223 N69-34199
- Gasification of coal enrichment wastes
p0116 N70-10884
- The dependence of gas production costs on the degree of oxygen blast enrichment during gasification of lignite under pressure
p0117 N70-16885
- Mining thermophysics
p0089 N70-16584
- Practical application of underground heat sources
p0089 N70-16585
- Prospects for thermal water exploration in Transcarpathian region of Ukrainian SSR
p0090 N70-16586
- Result of geothermal measurements in deep boreholes of petroleum-bearing regions of the Ukraine
p0090 N70-16587
- Filtration of heat carriers in earth core rocks at a depth of from 6 to 8 kilometers
p0090 N70-16588
- Pressure effects on filtration of a heat carrier in earth core rocks
p0090 N70-16589
- Calculations on boiler apparatus for exploiting sub-surface heat sources
p0090 N70-16590
- Calculating the index of endogenic inflammability on the basis of heat transfer and thermochemical processes
p0090 N70-16595
- AKTIEBOLAGET ATOMENERGI, STOCKHOLM (SWEDEN).**
Nonlinear dynamic model of power plants with single-phase coolant reactors
[AF-3411] p0217 N69-21373
- Thermodynamic analysis of a supercritical mercury power cycle
[AE-355] p0224 N69-35785
- AKTIEBOLAGET ATOMENERGI, STUDSVIK (SWEDEN).**
Uranium market
[NP-19069] p0099 N72-20603
- ALABAMA UNIV., UNIVERSITY.**
Investigations using data in Alabama
[E73-10509] p0107 N73-22284
- ALLIS-CHALMERS MFG. CO., MILWAUKEE, WIS.**
Research and development on fuel cell systems
Quarterly progress report, Jan. 1 - Mar. 31, 1966
[NASA-CR-90210] p0191 N68-11030
- AMERICAN UNIV., WASHINGTON, D.C.**
Digital analysis of Potomac River Basin ERTS imagery: Sedimentation levels at the Potomac-Anacostia confluence and strip mining in Allegheny County, Maryland
[PAPER-E13] p0110 N73-28277
- AMPHEX CORP., REDWOOD CITY, CALIF.**
Design, fabrication and testing of a foil gas-bearing test rig
[NASA-CR-1563] p0231 N70-25623
- APPLIED PHYSICS LAB., JOHNS HOPKINS UNIV., SILVER SPRING, MD.**
Instrument for studying the oxidizability of petroleum hydrocarbons at high temperatures
[TG-230-T533] p0079 N68-15844
- Primary energy storage and the super flywheel
[AD-697906] p0265 N70-22537
- Solar panel test set
[AD-707345] p0059 N70-38210
- ARGONNE NATIONAL LAB., ILL.**
Anion-exchange behavior of light rare earths in aqueous methanol solutions containing neutral nitrates. 2 - Macro-micro separations
[ANL-TRANS-508] p0192 N68-12691
- Chemical Engineering Division Semiannual report, Jul. - Dec. 1967
[ANL-7425] p0012 N69-15807
- Nonaqueous fuel processing - Research conducted in France
[ANL-TRANS-704] p0084 N69-25563
- Chemical Engineering Division Annual report, 1968
[ANL-7575] p0090 N70-19586
- Work plan for continuation of the project reduction of atmospheric pollution by the application of fluidized bed combustion
[ANL/ES-CEN-1003] p0096 N71-36736
- Experimental two phase liquid-metal MHD generator program
[AD-747323] p0250 N73-12064
- Development of high-specific-energy batteries for electric vehicles
[ANL-7953] p0267 N73-19061
- Lithium/sulfur batteries for off-peak energy storage: A preliminary comparison of energy storage and peak power generation systems
[ANL-7958] p0268 N73-30058
- ARIZONA UNIV., TUCSON.**
Exploration and exploitation of geothermal resources in arid and semiarid lands: A literature review and selected bibliography
[PB-218830/8] p0109 N73-27359
- ARKANSAS UNIV., FAYETTEVILLE.**
Magnetohydrodynamic studies in cylindrical systems with power generation applications
p0204 N68-29990
- Energy transfer problems in superconductors and flowing plasmas Final report
[UAPL-31] p0207 N68-37342
- ARMY AIR MOBILITY RESEARCH AND DEVELOPMENT LAB., CLEVELAND, OHIO.**
Preliminary appraisal of hydrogen and methane fuel in a Mach 2.7 supersonic transport
[NASA-TM-X-68222] p0020 N73-22711
- ARMY ELECTRONICS COMMAND, FORT MONMOUTH, N.J.**
Fast transient response fuel cell-battery hybrid power source
[AD-692538] p0226 N70-10447
- Power sources for long economic life communications equipment
[AD-693847] p0227 N70-13293
- Proceedings of the Annual Power Sources Conference, 20-22 May 1969
[AD-696428] p0230 N70-21253
- Ultra-reliable power processor for hydrocarbon-air fuel cell power systems
[AD-699311] p0231 N70-23985
- Solar charger kit experimental
[AD-734809] p0063 N72-19066

ARMY ELECTRONICS LABS.,

CORPORATE SOURCE INDEX

- Electromechanical energy conversion devices utilizing both conventional and rare earth cobalt permanent magnet materials
[AD-756433] p0252 N73-22168
- ARMY ELECTRONICS LABS., FORT MONMOUTH, N.J.
Fuel cell - Battery power sources for electric cars
[AD-662235] p0193 N68-15525
Fuel cell-energy storage hybrid systems for vehicles
[AD-662236] p0193 N68-15641
Battery-fuel cell system
[AD-662234] p0194 N68-15712
Power sources for electric cars
[ECOM-2929] p0202 N68-23140
- ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER, CHARLOTTESVILLE, VA.
Study of a model of an MHD generator using an argon potassium plasma
[AD-728591] p0246 N72-13698
Thermoelectric generators
[AD-741858] p0248 N72-29045
Double-mirror solar energy concentrators using nickel parabolic reflectors
[AD-741880] p0064 N72-29046
Series of no-contact synchronous generators with outputs up to 100 kV for wind driven electric units
[AD-742641] p0101 N72-31082
Semiconductor solar energy converters and the phenomenon of photo conductivity quenching
[AD-743031] p0064 N72-31083
Contemporary status of studies on direct conversion of solar energy to electrical energy
[AD-747293] p0065 N73-11050
Fuel cells and prospects for their use in railroad transportation
[AD-747512] p0250 N73-13056
Autonomous energetics: Energy sources for the earth, sea and space
[AD-753828] p0020 N73-18093
Film solar energy collector with concentric circular seams
[AD-755829] p0067 N73-21712
Heterogeneous solar converters based on polycrystalline cadmium sulfide and cadmium selenide
[AD-756594] p0067 N73-21960
Space electric power plants, part 2
[AD-756039] p0067 N73-21973
Performance reliability calculation for a modular solar thermoelectric generator
[AD-757087] p0067 N73-23015
Calculation and cost optimization of certain solar generator thermobattery parameters
[AD-759812] p0068 N73-25104
Development and investigation of high temperature combustor to be used for a solid fuel MHD generator and thermodynamic analysis of combustion conditions
[AD-764153] p0254 N73-31848
Solar and wind power to be harnessed
[AD-765783] p0069 N73-33011
- ARMY FOREIGN SCIENCE AND TECHNOLOGY CENTER, WASHINGTON, D.C.
Growth of microorganisms in media with petroleum fuels
[AD-680804] p0083 N69-20205
Magnetic systems using steel for magnetohydrodynamic generators
[AD-688393] p0224 N69-35280
- ASTRO RESEARCH CORP., SANTA BARBARA, CALIF.
Application of isotope flywheels to spacecraft energy and angular momentum storage
[NASA-CR-1971] p0266 N72-17020
- ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, LUCAS HEIGHTS (AUSTRALIA).
The production of nuclear grade uranium dioxide powders from Australian ores
[CONF-690815-3] p0090 N70-17649
Nuclear fuel and materials /U, Be, Zr/ for reactor
[LIB/TRANS-240] p0093 N70-33032
Separation nozzle demonstration plant for uranium enrichment
[NP-TR-1884] p0094 N70-39255
- ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT, RISO (DENMARK).
Description of the URU-programme
[RISO-R-684] p0082 N68-33991
- ATOMIC ENERGY COMMISSION, OAK RIDGE, TENN.
Abundant nuclear energy
p0013 N70-14504
Controlled fusion and plasma research; A literature search
[TID-3557-1971-SUPPL] p0250 N73-12785
- ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
Nuclear energy source limitations for dynamic energy conversion systems
p0195 N68-17794
The nuclear industry
[TID-24102] p0010 N68-18384
Radioisotopes - Production and development of large-scale uses
p0082 N68-30262
Selected background information on uranium enriching
[ORO-668] p0086 N69-31272
Use of thorium in nuclear power reactors
[WASH-1097] p0090 N70-19219
The fusion torch - A new approach to pollution and energy usage
[CONF-691108-2] p0015 N70-37081
Pulsed thermonuclear reactor operated with lasers
[AEC-TR-7148] p0237 N70-38825
Magnetoplasmadynamic /MPD/ converters
[AEC-TR-7161] p0239 N71-15010
Energy sources of tomorrow
p0095 N71-29852
Environmental considerations in the regulatory process for plants in the U.S.: The role of the public and public understanding
[IAEA-SM-146/5] p0017 N71-35176
Hydrogen and other synthetic fuels: A summary of the work of the Synthetic Fuels panel
[TID-26136] p0118 N73-33738
- ATOMIC ENERGY ESTABLISHMENT, WINFRITH (ENGLAND).
Nuclear reactors as a source of power in space
p0226 N70-11305
- ATOMICS INTERNATIONAL, CANOGA PARK, CALIF.
Heavy water organic cooled reactor. The preparation of uranium carbide from economical uranium compounds
[AI-CE-73] p0078 N68-11281
Non-equilibrium ionization in a potassium gas MHD device. Final report
[AI-67-138] p0192 N68-11928
Nuclear space power systems - Reactors, conversion equipment, and power systems technology
p0192 N68-12191
Failure data handbook for nuclear power facilities. A guide for the design, construction, and maintenance of nuclear power plants from a reliability improvement standpoint. Volume 1 - Failure data and applications technology
[LMPC-MEMO-69-7-VOL-1] p0234 N70-31239
Failure Data Handbook for Nuclear Power Facilities. A guide for the design, construction, and maintenance of nuclear power plants from a reliability improvement standpoint. Volume 2 - Failure category identification and glossary
[LMPC-MEMO-69-7-VOL-2] p0234 N70-31812
- AVCO CORP., LOWELL, MASS.
Isotope reentry vehicle design study - Conceptual design, phase 1A. Topical report
[NASA-CR-72366] p0081 N68-25283
- AVCO CORP., WILMINGTON, MASS.
Isotope reentry vehicle design study preliminary design - Phase 2. Final report
[NASA-CR-72555] p0223 N69-34980
- AVCO-EVERETT RESEARCH LAB., EVERETT, MASS.
Eleventh AFOSR Contractors' Meeting on Non-Chemical Energetics - Summaries of research
[AFOSR-68-1377] p0206 N68-31928
Instability of Hall MHD generators to magneto-acoustic waves
[RR-323] p0217 N69-21275
Research on inert gas MHD energy conversion
Final report
[AD-694529] p0228 N70-15650
Comparison of experimental and analytical results for a 20 MW combustion-driven Hall configuration MHD generator
[RR-344] p0231 N70-24132
Research on MHD energy conversion
Final report
[AD-720257] p0241 N71-26190

- MHD power generation - State of the art and prospects for advanced nuclear applications
p0243 N71-33661
- Experimental research on a 400 kW high power density MHD generator
[AD-725739] p0245 N72-11065
- Experimental and analytical research on a two megawatt, high performance MHD generator
[AD-756489] p0253 N73-23765
- AETEC SCHOOL OF LANGUAGES, INC., ACTON, MASS.
Electrical field in an MGD-channel of a rectangular section with semiterminal electrodes
[NASA-TT-P-12010] p0214 N69-14070
- The basic principles for optimum shielding of nuclear apparatus onboard spacecraft
p0224 N69-38756
- B**
- BARRINGER RESEARCH LTD., REIDALE (ONTARIO).
Correlation spectrometry applied to earth resources
p0099 N72-23284
- BATTELLE COLUMBUS LABS., OHIO.
Relevance of ERTS to the State of Ohio
[E72-10259] p0102 N73-12358
- Relevance of ERTS-1 to the state of Ohio
[E73-10032] p0104 N73-15365
- A brief overview of the energy requirements of the Department of Defense
[AD-754824] p0106 N73-20819
- BATTELLE INST., FRANKFURT AM MAIN (WEST GERMANY).
The importance of unconventional methods of energy conversion for developing countries
p0093 N70-38678
- BATTELLE MEMORIAL INST., COLUMBUS, OHIO.
The federal R and D plan for air pollution control by combustion-process modification
Final report
[PB-198066] p0017 N71-31900
- BATTELLE MEMORIAL INST., RICHLAND, WASH.
A review and comparison of selected United States energy forecasts
[PB-189938] p0015 N70-37343
- BATTELLE-NORTHWEST, RICHLAND, WASH.
Results from USAEC plutonium utilization programs conducted by Battelle-Northwest
[BNWL-SA-2065] p0082 N69-15237
- Phoenix fuel evaluation in a maritime reactor design
[BNWL-851] p0082 N69-15543
- Potential of using mixed fission products as a source of energy
[BNWL-1115] p0224 N69-38506
- Factors affecting the optimum fuel cycle
[BNWL-SA-3605] p0094 N71-21050
- BELL HELICOPTER CO., FORT WORTH, TEX.
The effect of advanced propulsion on future rotary wing type aircraft
p0218 N69-23996
- BENDIX CORP., ANN ARBOR, MICH.
Ecological effects of strip mining in Ohio
[E72-10069] p0101 N72-31353
- Ecological effects of strip mining in Ohio
[E72-10256] p0102 N73-12356
- Determine utility of ERTS-1 to detect and monitor area strip mining and reclamation
[E72-10284] p0103 N73-13334
- Ecological effects of strip mining in Ohio
[E73-10003] p0019 N73-15339
- Ecological effects of strip mining in Ohio
[E73-10430] p0106 N73-20391
- Preliminary evaluation of the 15 October 1972 ERTS-1 imagery of east central Ohio (scene 1034-15415)
[E73-10454] p0106 N73-20413
- Determine utility of ERTS-1 to detect and monitor area strip mining and reclamation
[E73-10641] p0107 N73-25338
- ERTS-1 investigation of ecological effects of strip mining in eastern Ohio
[PAPER-E2] p0109 N73-28266
- BOEING CO., SEATTLE, WASH.
Large area solar array Quarterly report - Phase 2, 1 Mar. - 31 May 1968
[NASA-CR-95999] p0051 N68-31404
- Lightweight solar panel development
[NASA-CF-117349] p0061 N71-20727
- Simulated space environment tests on cadmium sulfide solar cells
[NASA-CR-120840] p0063 N72-14029
- BOLKOW ENTWICKLUNGEN K. G., MUNICH (WEST GERMANY).
Development of advanced solar cell modulus technology for use by solar probes and large area solar cell arrays
[RF-93-0] p0048 N68-22010
- Solar cells and their application to space traveling
[RF-89-0] p0052 N69-11991
- BOSCH (ROBERT) G.M.B.H., STUTTGART (WEST GERMANY).
Technical reports, volume 2, no. 5
p0265 N69-34688
- Development of batteries for automobiles with electric propulsion
p0265 N69-34689
- BRITISH AIRCRAFT CORP., FULTON (ENGLAND).
A study of advanced solar array design Quarterly report, 1 Aug. - 31 Oct. 1969
[ESRO-CR-12] p0058 N70-30140
- BROOKHAVEN NATIONAL LAB., UPTON, N.Y.
Pollution-free hybrid fossil-nuclear fueled MHD power cycle
[BNL-12319] p0202 N68-26381
- Hybrid fossil-nuclear fueled MHD power cycles
[BNL-12569] p0082 N69-11230
- Ecological effects of energy: A basis for policy in regional planning
[BNL-16228] p0018 N72-20371
- BROWN UNIV., PROVIDENCE, R.I.
Photovoltaic solar energy conversion
p0058 N70-30228
- Performance of actual solar cells
p0058 N70-30229
- An analysis and design study of the compressible, traveling wave, magnetohydrodynamic, induction generator
p0241 N71-26449
- BUREAU OF MINES, BARTLESVILLE, OKLA.
Influence of volatile fuel components on vehicle emissions
[BM-RI-7291] p0117 N70-20511
- Comparative emissions from some loaded and prototype lead-free automobile fuels
[BMRI-7390] p0092 N70-28685
- Clean automotive fuel: Engine emissions using natural gas, hydrogen-enriched natural gas, and gas manufactured from coal (Synthane)
[TPR-48] p0099 N72-18761
- A field survey of emissions from aircraft turbine engines
[BM-RI-7634] p0100 N72-25584
- Emission characteristics of propane as automotive fuel
[BM-RI-7672] p0101 N72-31768
- The association of automotive fuel composition with exhaust reactivity
[BM-RI-7756] p0109 N73-27542
- Bureau of Mines energy program, 1972
[BM-IC-8612] p0111 N73-30335
- BUREAU OF MINES, DENVER, COLO.
Satellite monitoring of open pit mining operations
[BM-IC-8530] p0107 N73-24432
- BUREAU OF MINES, MORGANTOWN, W.VA.
Bureau of Mines energy program, 1971
[BM-IC-8551] p0101 N72-30123
- BUREAU OF MINES, PITTSBURGH, PA.
Clean automotive fuel: Laboratory-scale operation of the synthane process
[TPR-49] p0099 N72-18760
- The remote sensing of air pollution from coal utilization
p0101 N72-29363
- Experimental investigations of an open-cycle, vortex MHD generator
[BM-RI-7699] p0251 N73-14746
- BUREAU OF MINES, WASHINGTON, D.C.
Initiation of spherical detonation in acetylene-oxygen mixtures
[BM-RI-7061] p0116 N68-12434
- Review of Bureau of Mines energy program, 1970
[BM-IC-8526] p0096 N71-36393
- Economics of mixed potassium-cesium seeding of an MHD combustion plasma
[PB-214314/7] p0253 N73-25102

- Minerals yearbook, 1970. Volume 2: Area reports, domestic
[PB-214329/5] p0108 N73-25411
- C**
- CALIFORNIA UNIV., BERKELEY.
Heat transfer from radioisotopic power sources in porous media
[AD-691213] p0225 N69-40031
The future of vehicular power plants
p0016 N70-39315
Cryogenics, superconducting magnets, and fusion power: A glimpse into the future
[UCRL-73187] p0019 N73-12741
CALIFORNIA UNIV., BERKELEY. LAWRENCE RADIATION LAB.
Treatise in organic geochemistry
[NASA-CR-93111] p0079 N68-17316
CALIFORNIA UNIV., LIVERMORE. LAWRENCE LIVERMORE LAB.
Survey of hydrogen's potential as a vehicular fuel
[UCRL-51228] p0020 N73-16766
Development of materials for energy related applications
[UCRL-74697] p0022 N73-33005
CALIFORNIA UNIV., LIVERMORE. LAWRENCE RADIATION LAB.
Flux-compression generators
[UCRL-TRANS-10133] p0192 N68-14541
Report of the Ad Hoc Panel on fusion research on low-beta plasmas confined in open-ended geometries
[TID-24254] p0203 N68-29063
Conceptual design of a 10-MW sub e nuclear Rankine system for space power
[UCRL-50382] p0205 N68-30760
One-dimensional calculations on a finite-length MHD induction generator
[UCRL-70795] p0205 N68-31910
Computational problems in plasma physics and controlled thermonuclear research
[UCRL-71205] p0207 N68-35919
Large superconducting baseball magnet, part 1
[UCRL-71010] p0218 N69-22640
Rankine cycle systems studies for nuclear space power
[UCRL-70863] p0218 N69-23173
One-dimensional calculations on a finite-length MHD induction converter
[UCRL-50537] p0221 N69-28635
Controlled thermonuclear power
[UCRL-71500] p0226 N70-12638
Radon daughter equilibrium measurements in uranium-mine atmospheres
p0088 N70-14317
Mirror systems - Fuel cycles, loss reduction, and energy recovery
[UCRL-71753] p0092 N70-28899
Fusion power - Direct conversion and the reduction of waste heat
[TID-25414] p0237 N70-39141
Some economic aspects of power conversion for fusion reactors
[UCRL-72349] p0239 N71-15242
Direct conversion of fusion energy to electricity
[UCRL-72411] p0240 N71-15736
Experimental and computational investigations of the direct conversion of plasma energy to electricity
[CONF-710607-126] p0244 N71-38463
CALIFORNIA UNIV., LOS ANGELES.
Thermal behavior and design of cellular matrix-porous bed solar thermal converters
p0062 N71-28586
CAMBRIDGE THERMIONIC CORP., MASS.
Modification of dc motor with magnetically suspended rotor to give higher momentum storage capacity, supplement Technical report, 1 Apr. - 31 Jul. 1970
[NASA-CR-115792] p0266 N71-13514
CARNEGIE-MELLON UNIV., PITTSBURGH, PA.
Heterojunction solar cell calculations
[NASA-CR-49827] p0056 N70-12119
CATHOLIC UNIV. OF AMERICA, WASHINGTON, D.C.
Electromagnetic wave energy converter
[NASA-CASE-GSC-11394-1] p0254 N73-32109
CENTRAL MECHANICAL ENGINEERING RESEARCH INST., DURGAPUR (INDIA).
Prospects of solar power plants in India
[N71] p0054 N69-24313
CENTRALNY INSTYTUT INFORMACJI NAUKOWO-TECHNICZNEJ I EKONOMICZNEJ, WARSAW (POLAND).
Nukleonika, volume 15, no. 3, 1970
[ABC-TR-7102/3] p0245 N72-11610
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE, BRUSSELS (BELGIUM).
Compilation of references on the direct conversion of heat into electrical energy
[BLG-427] p0223 N69-32934
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE, MOL (BELGIUM).
Large scale production of Ac-227 and development of an isotopic heat source fueled with Ac203
[A/CONF-49/P/287] p0098 N72-16196
CENTRE DE RECHERCHES EN PHYSIQUE DES PLASMAS, LAUSANNE (SWITZERLAND).
Bibliographic compilation and tabulation of resources, of their consumption and their waste in the world
[LRP-63/73] p0021 N73-30075
CENTRE NATIONAL D'ETUDES SPATIALES, BRETAGNE-SUR-ORGE (FRANCE).
Isotopic energy sources
p0226 N70-11304
CENTRE NATIONAL D'ETUDES SPATIALES, PARIS (FRANCE).
Space solar generator degradation and influence on their design
p0055 N69-35592
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, BELLEVUE (FRANCE).
Cadmium telluride solar photocells
p0050 N68-28744
CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE, PARIS (FRANCE).
Limitations of solar collectors for converters
p0047 N68-17804
CIT COMPAGNIE INDUSTRIELLE DES TELECOMMUNICATIONS, BRUYERES-LE-CHATEL (FRANCE).
Thermoelectric conversion process: Application to radioisotope sources
[PRNC-COMP-13] p0248 N72-28731
CLEVITE CORP., CLEVELAND, OHIO.
CdS solar cell development Final report
[NASA-CR-72534] p0054 N69-23369
Improvements in CdS thin film solar cells Final technical report, 1 Nov. 1969 - 31 Oct. 1970
[AD-723315] p0062 N71-31939
COAST GUARD, WASHINGTON, D.C.
Results of overflights of Chevron oil spill in Gulf of Mexico Final report
[NASA-CR-117497] p0095 N71-21304
Oil pollution liability and financial responsibility. A report to the President and the Congress Final report
[PB-198775] p0017 N71-32624
The applicability of remote sensor techniques for oil slick detection
[AD-728422] p0098 N72-14478
COMBUSTION ENGINEERING, INC., WINDSOR, CONN.
Heavy water organic cooled reactor. The preparation of uranium carbide from economical uranium compounds
[AI-CE-73] p0078 N68-11281
Review of FBR core design problem areas
p0087 N69-35240
COMISION NACIONAL DE ENERGIA ATOMICA, BUENOS AIRES (ARGENTINA).
Determination of uranium with a potential-controlled coulometric titrator
[CNFA-192] p0079 N68-17192
COMITATO NAZIONALE PER L'ENERGIA NUCLEARE, ROME (ITALY).
Sol-gel research and development in Italy
[RT/CHI/68/28] p0082 N69-11048
Status of the research on closed cycle MHD power generation
[RT/ING-71] 20 p0250 N73-12780
COMMISSARIAT A L'ENERGIE ATOMIQUE, BRUYERES-LE-CHATEL (FRANCE).
Peaceful applications of nuclear explosions: Mines, chemistry, and gas and oil extraction
[CEA-BIB-129-ADD-1] p0104 N73-17719
COMMISSARIAT A L'ENERGIE ATOMIQUE, CADARACHE (FRANCE).
Peqase reactor loops
[CEA-R-3564] p0221 N69-27494
COMMISSARIAT A L'ENERGIE ATOMIQUE, CHOSCLAN (FRANCE).
The usefulness of the decay rate in the management of radioactive waste stocks
[CEA-R-3731] p0087 N69-38022

COMMISSARIAT A L'ENERGIE ATOMIQUE,
FONTENAY-AUX-ROSES (FRANCE).

Treatment of fuel by the dry method. Studies performed in France [CEA-COMP-1195] p0083 N69-25510

Reprocessing of irradiated plutonium and uranium mixed oxides [CEA-COMP-1534] p0093 N70-39139

COMMISSARIAT A L'ENERGIE ATOMIQUE, LINEIL (FRANCE). Study of the electrical behavior of various magnetohydrodynamic generators using explosives [CEA-R-3710] p0222 N69-30078

COMMISSARIAT A L'ENERGIE ATOMIQUE, PARIS (FRANCE). Technical aspects and economic incidents of transportation in the fuel cycle [CEA-COMP-1093] p0257 N69-27096

COMMISSARIAT A L'ENERGIE ATOMIQUE, SACLAY (FRANCE). Design of a pilot cell for strontium-90 extraction by solvent [EUR-3613.F] p0078 N68-10864

Energy storage possibilities of superconductors with a view to large power discharges [CEA-R-3243] p0263 N68-15938

On the behavior of energy conversion left from vapor ionized by fission products p0196 N68-17808

All-metal thermionic nuclear module [CEA-COMP-1041] p0218 N69-24985

One volt isotopic microgenerators [CEA-R-3834] p0225 N69-40586

COMMITTEE ON COMMERCE (U. S. SENATE). Air pollution - 1970, part 3 p0016 N70-41770

Energy research and development p0020 N73-20976

COMMITTEE ON INTERIOR AND INSULAR AFFAIRS (U. S. SENATE). Magnetohydrodynamics /MHD/ - Pollution-free production of electrical energy from low-grade coal, part 2 p0236 N70-36136

Magnetohydrodynamics /MHD/ - Pollution-free production of electrical energy from low-grade coal p0236 N70-36137

Fuels and energy p0096 N71-30165

National fuels and energy policy p0096 N71-35181

Advanced power cycles p0019 N72-30977

COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE (U. S. HOUSE). Air pollution control research into fuels and motor vehicles p0015 N70-36154

COMMITTEE ON PUBLIC WORKS (U. S. SENATE). Air pollution - 1970, part 3 p0016 N70-41770

Air pollution - 1970, part 4 From the Subcommittee on Air and Water Pollution p0016 N70-41771

Some environmental implications of national fuels policies p0016 N71-29471

Oil sludge dumping off the Florida coast p0096 N71-35178

COMMITTEE ON SCIENCE AND ASTRONAUTICS (U. S. HOUSE). An inventory of energy research, volume 1 p0018 N72-23948

Briefings, before the Task Force on Energy of Subcommittee on Science, Research, and Development, volume 2 p0018 N72-25929

An inventory of energy research p0018 N72-25931

Briefings before the Task Force on Energy of the Subcommittee on Science, Research, and Development, volume 2 p0019 N73-10980

Solar energy research. A multidisciplinary approach p0066 N73-14812

Energy research and development p0020 N73-17989

The Federal Government and energy research and development historical background p0021 N73-22928

Briefings before the Task Force on Energy,
volume 3

Short term energy shortages p0021 N73-23969

COMMONWEALTH EDISON CO., CHICAGO, ILL. Utility requirements in fast breeders p0022 N73-33928

COMMUNICATIONS SATELLITE CORP., WASHINGTON, D.C. Foreign Solar Cell Symposium Summary report p0087 N69-35243

COMPAGNIE GENERALE DE TELEGRAPHIE SANS FIL, PUTEAUX (FRANCE). Photo-voltaic cells with concentrators p0060 N71-17248

COMPUTER AND APPLIED SCIENCES, INC., PHILADELPHIA, PA. Gaseous fission closed loop MHD generator p0199 N68-17828

COMPUTER SCIENCES CORP., FALLS CHURCH, VA. Fuel cells: A survey [NASA-SP-5115] p0243 N71-33632

COOPERATION MEDITERRANEE POUR L'ENERGIE SOLAIRE, MARSEILLE (FRANCE). Mediterranean cooperation for solar energy, bulletin no. 22 [BULL-22] p0253 N73-26045

New heliotechnique p0069 N73-33762

Reflections on heliothermic transformation of direct solar radiation p0069 N73-33763

CORNELL UNIV., NEW YORK. The design, modeling, and optimization of a space oriented radioisotope thermoelectric power supply p0069 N73-33767

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH, PRETORIA (SOUTH AFRICA). Wankel engines for aircraft [REPT-908] p0251 N73-16636

p0247 N72-20764

D

DEFENSE DEPT., WASHINGTON, D.C. Interior coating systems for surfaces in contact with petroleum fuels Technical manual [AD-666969] p0263 N68-23614

DEFENSE DOCUMENTATION CENTER, ALEXANDRIA, VA. Magnetohydrodynamic generators, volume 1 Report bibliography, 1953 - 1968 [AD-686000] p0222 N69-32347

Solar cells and solar panels, volume 1 Report bibliography, Jan. 1958 - Oct. 1969 [AD-700500] p0058 N70-29273

DELAWARE BAY OIL TRANSPORT COMMITTEE, DOVER. Energy, oil, and the state of Delaware. A proposal for safeguarding the Delaware estuary and coastline by safer transport of oil p0104 N73-16948

DEPARTMENT OF TRANSPORTATION, WASHINGTON, D.C. Aircraft and air pollution, selected readings [AD-735943] p0099 N72-23655

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, BRUNSWICK (WEST GERMANY). Possible space application of nuclear power supply, particularly for direct TV-broadcasting [BMW-FB-W-70-16] p0233 N70-30407

DEUTSCHE FORSCHUNGS- UND VERSUCHSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART (WEST GERMANY). The fuel cell concept - A review of basic principles [DLR-MITT-70-09] p0239 N71-15723

Energy storage in superconducting coils [DLR-FB-72-10] p0267 N72-26656

General investigation and parametric study of inductive MHD converters including design and development of a cryogenically cooled experimental 4 kW converter [DLR-FB-71-74] p0251 N73-15757

DEUTSCHE FORSCHUNGSANSTALT FUER LUFT- UND RAUMFAHRT, STUTTGART (WEST GERMANY). Magnetoplasmodynamic /MPD-/ converters [DLR-FB-69-85] p0232 N70-26208

Theoretical analysis of an inductive, cylindrical MHD converter with cryogenically cooled windings [DLR-FB-70-25] p0240 N71-17840

DEUTSCHE VERSUCHSANSTALT FUER LUFT- UND BAUFABRIK, STUTTGART (WEST GERMANY).

- High temperature energy systems with plasma reactors and inductive magnetoplasma dynamic converters
[DLR-FB-67-59] p0191 N68-11139
- Optimization of the MHD-generator using a liquid metal as a working medium
[DLR-FB-67-71] p0193 N68-14746
- Energy conversion using magnetocaloric and electrocaloric effects
[DLR-68-005] p0201 N68-22013
- The electrofluid dynamic energy converter with spacecharge neutralization p0216 N69-18450

DORNIER-WERKE G.M.B.H., FRIEDRICHSHAFEN (WEST GERMANY).

- Problems of energy supply p0201 N68-21480

DOW CHEMICAL CO., GOLDEN, COLO.

- Static bed reactor for studies of a plutonium hexafluoride volatility process
[RFP-1048] p0280 N68-19265
- Fluoride volatility Conference proceedings
[CONF-680610] p0087 N69-37355

DU PONT DE NEMOURS (E. I.) AND CO., AIKEN, S.C.

- Savannah River Laboratory isotopic power and heat sources. Part 1 - Co-60 Quarterly progress report, Oct. - Dec. 1968
[DP-1192-1] p0086 N69-31541
- Regulated dc to dc converter for voltage step-up or step-down with input-output isolation
[NASA-CASR-HQN-10792-1] p0248 N72-27230

E**EARTH SATELLITE CORP., WASHINGTON, D.C.**

- Remote sensing for mined area reclamation:
Application inventory
[NASA-CR-124608] p0097 N72-12329
- Study of application of ERTS-1 imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10364] p0102 N72-32336
- Study of application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10371] p0105 N73-19366
- Application of EREP imagery to fracture related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277
- Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-10970] p0111 N73-30311

EASON OIL CO., OKLAHOMA CITY, OKLA.

- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E72-10327] p0103 N73-14315
- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-10322] p0105 N73-18354
- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-10444] p0106 N73-20404
- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-10646] p0108 N73-25342
- An evaluation of the suitability of ERTS data for the purposes of petroleum exploration
[E73-11053] p0112 N73-32229

EDISON WATER QUALITY LAB., N.J.

- Biological effects of oil pollution - Bibliography. A collection of references concerning the effects of oil on biological systems
[EB-188206] p0014 N70-21569

ELECTRICITE DE FRANCE, PARIS.

- Experimental aerogenerator type BEST - Romani, description, assembly, test program
[NASA-TT-F-15037] p0110 N73-29004

ELECTRO-OPTICAL SYSTEMS, INC., PASADENA, CALIF.

- Planetary solar array development Quarterly report
[NASA-CR-91730] p0046 N68-14185

Development of lightweight solar panels Summary report, Jan. 1966 - Mar. 1969

- [NASA-CR-66832] p0055 N69-38646
- Development of lightweight aluminum hollowcore solar cell array technology
[NASA-CR-112002] p0063 N72-13046
- ENERGY RESEARCH CORP., BETHEL, CONN.
Hydrogen generator assemblies
[AD-733931] p0118 N72-18520
- ENGELHARD MINERALS AND CHEMICALS CORP., NEWARK, N.J.
Open cycle fuel cell power plant direct currents, 1.5 KW
[AD-764285] p0254 N73-30979
- ENTE NAZIONALE PER L'ENERGIA ELETTRICA (ENEL), ROME (ITALY).
Programs for use of plutonium in thermal reactors
[EUR-3890.I] p0081 N68-23663
- ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C.
Compilation of air pollutant emission factors
[AP-42-REV] p0099 N72-19686
- ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION, IDAHO FALLS, IDAHO.
Relative dose factors from long-period point source emissions of atmospheric pollutants
p0011 N68-38380
- ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION, SILVER SPRING, MD.
Diffusion measurements at medium range from a continuous point source p0012 N68-38392

Meteorology and atomic energy, 1968

- [TID-24190] p0012 N69-17184
- ERNEST TURNER ELECTRICAL INSTRUMENTS, LTD., HIGH WYCOMBE (ENGLAND).
A study of advanced solar array design Quarterly report, 1 Aug. - 31 Oct. 1969
[ESRO-CR-12] p0058 N70-30140
- EUROPEAN ATOMIC ENERGY COMMUNITY, ISPRA (ITALY).
Can thorium compete with uranium? An assessment for heavy-water and graphite moderated reactors
[EUR-4264.B] p0085 N69-31081
- Pyrometallurgical concentration of enriched uranium in irradiated MTR fuel elements
[EUR-4243.F] p0085 N69-31119
- Hydrogen as an energy vector: New future prospects for applications of nuclear energy
[EUR-4838] p0020 N73-15699
- EUROPEAN NUCLEAR ENERGY AGENCY, PARIS (FRANCE).
MHD electrical power generation Status report, 1969 p0221 N69-28597

EUROPEAN SPACE RESEARCH AND TECHNOLOGY CENTER, NOORDWIJK (NETHERLANDS).

- Primary energy sources and conversion systems p0056 N70-11303
- Power systems in ESRO satellites
[ESRO-TN-83] p0057 N70-17621
- Design of solar cell arrays and their performance in space p0057 N70-22507
- Calibration of solar cells
[ESRO-TN-79] p0058 N70-30210
- Thin-film solar cells p0058 N70-30231
- Calibration of solar cells p0059 N70-30232
- EUROPEAN SPACE RESEARCH ORGANIZATION, PARIS (FRANCE).
Proceedings of the sixth ESRO summer school, Volume 6 - Space power systems - Introduction
[ESRO-SP-45] p0226 N70-11301
- EUROPEAN SPACE TECHNOLOGY CENTER, NOORDWIJK (NETHERLANDS).
Satellite power-conditioning and control - A summary of design possibilities
[ESRO-TN-54/ESTEC/] p0047 N68-18466
- Large astronomical satellite solar paddle configurations and available power
[ESRO-TN-P-5/ESTEC/] p0052 N69-15891

F**FABBRICA ITALIANA APPARECCHI RADIO S.P.A., MILAN (ITALY).**

- Solar array simulator p0064 N72-31077

CORPORATE SOURCE INDEX

GESELLSCHAFT FÜR WELTRAUMFORSCHUNG M.B.H.,

FAIRCHILD HILLER CORP., GERMANTOWN, MD.
Fabrication feasibility study of a 30 watt/
pound rollup solar array Final report
[NASA-CR-97208] p0052 N68-36630

FEDERAL AVIATION ADMINISTRATION, WASHINGTON, D.C.
Fuel considerations in the US supersonic
transport program p0117 N70-18542
[AD-696588]
Propulsion fuel system fire safety p0094 N70-40779

FEDERAL POWER COMMISSION, WASHINGTON, D.C.
Development of electrically powered vehicles
[PB-174982] p0193 N68-15499

FERRANTI, LTD., CHADDERTON (ENGLAND).
Development status of solar generators based on
silicon photovoltaic cells p0050 N68-28740

FLORIDA UNIV., GAINESVILLE.
A theoretical investigation and experimental
verification of the two-phase heat transfer
characteristics of a combined solar
collector-generator for a solar air conditioner
p0053 N69-17227

Study of nuclear seeded MHD plasmas Yearly
summary technical report no. 3, 1 May 1967 -
31 Nov. 1968 p0225 N69-39863
[AD-690542]
Transactions of the symposium on research on
uranium plasmas and their technological
application, 7-10 January 1970 p0229 N70-17651
[NASA-CR-107857]
Development of plasma diagnostic methods
applicable to direct energy conversion,
summary Final technical report
[AD-702405] p0233 N70-29012
Research on Uranium Plasmas and their
Technological Applications p0242 N71-33626
[NASA-SP-236]
Nuclear generated plasmas p0250 N73-12800
[AD-747681]
Solar energy, its conversion and utilization
p0066 N73-13866

FRAUNHOFER-GESELLSCHAFT, STUTTGART (WEST GERMANY).
Problems of room heating in summer p0059 N70-30560

G

GEARHART-OWEN INDUSTRIES, INC., FORT WORTH, TEX.
Gamma-ray logging in uranium prospecting
[SM-112/15] p0084 N69-30790

GENERAL DYNAMICS CORP., SAN DIEGO, CALIF.
Progress in optimizing the gas-cooled fast
breeder reactor p0081 N68-29161
[GA-8032]
GENERAL ELECTRIC CO., GAINESVILLE, FLA.
Optimization of design parameters for spacecraft
nickel-cadmium cells containing recombination
and control electrodes Quarterly report, Aug.
- Oct. 1968 p0265 N69-24894
[NASA-CR-100813]
GENERAL ELECTRIC CO., LYNN, MASS.
Fuel cell technology program p0247 N72-23053
[NASA-CR-115572]
GENERAL ELECTRIC CO., NEW YORK.
Fuel cells with molten-carbonate electrolytes
[REPT.-67-C-210] p0201 N68-21439
GENERAL ELECTRIC CO., PHILADELPHIA, PA.
Comparison of load bearing and non-load bearing
radiators for nuclear Rankine systems p0190 N68-10050
[NASA-CR-72307]
Application of radioisotopes for aerospace waste
reclamation and water systems p0080 N68-21041
[AMRL-TB-67-158]
Feasibility study of a 30 watts per pound roll
up solar array Quarterly technical report, 1
Jan. - 31 Mar. 1968 p0048 N68-21879
[NASA-CR-94243]
Nimbus 2 - Photovoltaic power systems on flight
spacecraft p0202 N68-24455
[NASA-CR-62045]
Feasibility study 30 watts per pound roll-up
solar array Final report p0051 N68-32561
[NASA-CR-96230]
Cadmium sulfide thin film solar cell array
sub-panel development Final report p0051 N68-33207
[NASA-CR-72439]

Photovoltaic power systems on flight spacecraft
Lunar Orbiter 3 p0054 N69-29374
[NASA-CR-100700]
Investigation of a large scale non-equilibrium
magnetohydrodynamic generator Annual report,
1 Aug. 1968 - 31 Jul. 1969 p0226 N70-11420
[AD-693153]
Performance of a large scale nonequilibrium MHD
generator with rare gases p0234 N70-31999
[AD-703314]
Optimization of a linear non-equilibrium MHD
generator p0237 N70-40031
[AD-707803]
Investigation of a large scale nonequilibrium
magnetohydrodynamic generator Annual report,
1 Aug. 1969 - 31 Jul. 1970 p0238 N71-10992
[AD-711351]
Rollup subsolar array. Volume 2 - Detailed test
results Final report p0061 N71-23714
[NASA-CR-118006]
Experiments in a large, non-equilibrium MHD
generator with cesium seeded, noble gases and
heated electrodes p0241 N71-24680
[AD-719381]
H2 fuel system investigation p0017 N71-29607
Investigation of a large scale nonequilibrium
magnetohydrodynamic generator p0246 N72-13211
[AD-728407]
Investigation of a non-equilibrium
magnetohydrodynamic generator p0250 N73-12068
[AD-747661]
Feasibility study of a 110 watt per kilogram
lightweight solar array system p0066 N73-15079
[NASA-CR-130287]
GENERAL ELECTRIC CO., SCHENECTADY, N.Y.
Characteristics of a thermionic converter with a
chloride vapor deposited tungsten emitter
/110/ and a nickel collector p0222 N69-32553
[NASA-CR-1416]
GENERAL MOTORS CORP., DAYTON, OHIO.
Thermally regenerative fuel cells p0199 N68-17825
GENERAL MOTORS DESERT PROVING GROUND, MESA, ARIZ.
Toward a cleaner environment p0094 N70-39314

GEOLOGICAL SURVEY, DENVER, COLO.
Potential applications of nuclear explosives to
the recovery of geothermal energy Progress
report for fiscal year 1965 p0088 N70-12921
[USGS-289-1]
GEOLOGICAL SURVEY, MENLO PARK, CALIF.
Identification of geostructures of continental
crust particularly as they relate to mineral
resource evaluation p0105 N73-18353
[E73-10321]
Identification of Geostructures of continental
crust, particularly as they relate to
mineral-resource evaluation p0112 N73-31339
[E73-11035]
GEOLOGICAL SURVEY, WASHINGTON, D.C.
Satellite geological and geophysical remote
sensing of Iceland p0111 N73-29225
[E73-10874]
GEORGE WASHINGTON UNIV., WASHINGTON, D.C.
Legal, economic, and technical aspects of
liability and financial responsibility as
related to oil pollution Final report p0017 N71-32625
[PB-198776]
The feasibility of detecting subsurface coal
fires in Wyoming and Montana from the ground,
on aerial photography and on satellite imagery p0107 N73-22384

GEORGIA INST. OF TECH., ATLANTA.
AFOSR contractors' 11th Meeting on Kinetics of
Energy Conversion - Abstracts of papers p0238 N71-12372
[AD-712738]
Gas core reactors for MHD power systems p0243 N71-33664
MHD generator performance limitations p0253 N73-28655
Power plant systems analysis p0253 N73-28657

GESELLSCHAFT FÜR WELTRAUMFORSCHUNG M.B.H., BAD
GODESBERG (WEST GERMANY).
Space experiment power supplies p0057 N70-24832

GLOBE-UNION, INC., EL MONTE, CALIF.
Design and fabrication of wraparound contact silicon solar cells
[NASA-CR-121003] p0067 N73-20044

GOODYEAR AEROSPACE CORP., AKRON, OHIO.
Thermally activated foaming compositions Patent
[NASA-CASE-LAR-10373-1] p0062 N71-26155

GOODYEAR ATOMIC CORP., PIKETON, OHIO.
Environmental radiation levels and concentrations. Second half and annual summaries, 1967
[GAT-553] p0010 N68-25106

GRAND JUNCTION OFFICE (AEC), COLO.
Statistical data of the uranium industry
[TID-25814] p0099 N72-20472

GRUMMAN AEROSPACE CORP., BETHPAGE, N.Y.
Clean and attractive urban power systems
[RE-439J] p0253 N73-22912

GULF GENERAL ATOMIC, SAN DIEGO, CALIF.
HTGR fuel reprocessing - Effects of including a silicon carbide coating on fertile fuel particles
[GAMD-8661] p0083 N69-17117

Neutron activation analysis identification of the source of oil pollution of waterways
p0088 N70-15236

Development of nuclear analytical techniques for oil slick identification, phase 1
[GA-9889] p0094 N71-15083

GULTON INDUSTRIES, INC., HAWTHORNE, CALIF.
DC power supply engineered magnetics model EMPS-252 for Brayton cycle power conversion system. Final report
[NASA-CR-72529] p0236 N70-36860

H

HEAT ENGINEERING AND SUPPLY CO., SAN GABRIEL, CALIF.
Design and manufacture of parasitic load resistors for Brayton power conversion system. Final report
[NASA-CR-72436] p0208 N69-10335

HELIOTEX, SYLMAR, CALIF.
Development of an integrated lightweight flexible silicon solar cell array. Quarterly technical report, 1 Jan. - 1 Apr. 1970
[NASA-CR-109527] p0057 N70-25500

Development of an integrated lightweight flexible silicon solar cell array. Final report
[NASA-CR-110913] p0059 N70-43081

HERCULES, INC., MAGNA, UTAH.
Explosive magnetohydrodynamic program
[AD-762934] p0254 N73-30890

HITMAN ASSOCIATES, INC., BALTIMORE, MD.
Solar flat plate. Final report
[NASA-CR-94615] p0049 N68-23987

HRB-SINGER, INC., STATE COLLEGE, PA.
Detection, delineation, and monitoring of subsurface coal fires by aerial infrared scanning
p0086 N69-33683

HUGHES AIRCRAFT CO., CULVER CITY, CALIF.
Prime power systems, part 6
p0060 N71-19649

HUGHES AIRCRAFT CO., LOS ANGELES, CALIF.
Solar panel fabrication. Patent
[NASA-CASE-XNP-03413] p0062 N71-26726

IDAHO NUCLEAR CORP., IDAHO FALLS.
Subassembly test program outline for FY 1969 and 1970
[IN-1313] p0088 N70-13396

Critical facilities
p0088 N70-14123

IDAHO UNIV., MOSCOW.
Thirty-five millimeter color oblique aerial photography as a tool for reconnaissance exploration for uranium mineralization in the Tertiary basins of Wyoming
p0100 N72-26334

ILLINOIS UNIV., CHICAGO.
Magnetohydrodynamic induction generator experimental study. Final technical report
[NASA-CR-110154] p0233 N70-29169

Magnetohydrodynamic generator experimental studies
[NASA-CR-127891] p0249 N72-30655

INDIANA GEOLOGICAL SURVEY, BLOOMINGTON.
Study of the application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E72-10193] p0102 N73-10372

Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10096] p0105 N73-18321

Study of application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10371] p0105 N73-19366

Application of ERTS-A imagery to fracture related mine safety hazards in the coal mining industry
[E73-10776] p0108 N73-27252

Application of EREP imagery to fracture related mine safety hazards and environmental problems in mining
[E73-10802] p0109 N73-27277

Study of application of ERTS-A imagery to fracture-related mine safety hazards in the coal mining industry
[E73-11034] p0112 N73-31338

INFORMATICS, INC., ROCKVILLE, MD.
Recent Soviet investigations in geothermy
[AD-750128] p0104 N73-15454

INSTITUT DE PHYSIQUE ATOMIQUE, CLOJ (ROMANIA).
Measurement of isotopic distribution in the evaluation of oil fields
[SH-112/27] p0085 N69-30861

INSTITUT FUER PLASMAPHYSIK G.M.B.H., GARCHING (WEST GERMANY).
The electrical conductivity in argon potassium and helium potassium plasmas with elevated electron temperatures in crossed electric and magnetic fields
[IPP-3/59] p0190 N68-10892

The effect of the electrode geometry on the currents and potentials in MHD generators
[IPP-3/68] p0207 N68-38458

Calculation of gas parameters in MHD generators
[IPP-3/97] p0230 N70-21895

Measurements of the potential and current density distributions in a simulated Faraday-type MHD generator working with argon-potassium plasma
[IPP-3/104] p0234 N70-31285

INSTITUTE FOR DEFENSE ANALYSES, ARLINGTON, VA.
One watt 30-day plus power sources
[AD-675936] p0264 N69-11907

Performance, analysis selection of balloon electrical power systems
[AD-682898] p0219 N69-25863

Optimization of energy storage for solar space power, appendix 1
p0056 N70-16229

INSTITUTE OF GAS TECHNOLOGY, CHICAGO, ILL.
Low-cost acid fuel cell stacks
[AD-744806] p0249 N72-33668

INSTITUTE OF NUCLEAR RESEARCH, WARSAW (POLAND).
Hall type MHD generators with nonuniform gas parameters along the channel axis
[INR-1107] p0235 N70-33335

Electrical parameters in the Faraday type MHD generator with nonuniform gas properties in the magnetic field direction
[INR-1095] p0235 N70-33547

Electrical parameters in the Faraday-type MHD generator with nonuniform gas properties in the electric field direction
[INR-1096] p0235 N70-33672

Numerical calculations of the electrical parameters in a Faraday-type MHD generator with two-dimensional gas flow
[INR-1199] p0241 N71-27207

INSTITUTE OF NUCLEAR TECHNIQUES, KRAKOW (POLAND).
On the feasibility of the determination of water, salt and sulphur in crude oil by means of neutron activation analysis
p0089 N70-15296

INTERIOR DEPT., WASHINGTON, D.C.
Environmental statement for the proposed prototype oil-shale leasing program, Volume 1: Descriptions of the regions and potential environmental impacts
[EIS-AA-72-5242-D-1-VOL-1] p0111 N73-29367

Environmental statement for the proposed prototype oil-shale leasing program. Volume 2: Energy alternatives [EIS-AA-72-5242-D-2-VOL-2] p0021 N73-29368

INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA (AUSTRIA). Nuclear techniques and mineral resources p0084 N69-30776

Nuclear energy and the environment Addendum to the Agency's report to the Economic and Social Council of the United Nations for 1969 - 1970 (INFCIRC/139/ADD-1) p0017 N71-33879

INTERNATIONAL RESEARCH AND DEVELOPMENT CO., LTD., NEWCASTLE (ENGLAND). A non-equilibrium electron mode for kilowatt range MHD space power p0197 N68-17812

ION PHYSICS CORP., BURLINGTON, MASS. Development of gallium arsenide solar cells [NASA-CR-135510] p0068 N73-30977

ISRAEL PROGRAM FOR SCIENTIFIC TRANSLATIONS, LTD., JERUSALEM. New method of investigating the strength properties of typical rocks in some coal and shale deposits p0083 N69-21442

JACKSON AND MORELAND, INC., BOSTON, MASS. Review and evaluation of Project Fuel Cell [OCR-17] p0192 N68-12477

JET PROPULSION LAB., CALIF. INST. OF TECH., PASADENA. Planetary solar array development Quarterly report [NASA-CR-91730] p0046 N68-14185

Six-converter solar thermionic generator JG-4/ Quarterly progress report, 1 Jul. - 15 Dec. 1967 [NASA-CR-92586] p0046 N68-15766

Solar thermionic generator development Quarterly report, 1 Sep. - 30 Nov. 1967 [NASA-CR-92520] p0047 N68-16074

Thermionic converter and generator tests [NASA-CR-94154] p0201 N68-21597

Feasibility study of a 30 watts per pound roll up solar array Quarterly technical report, 1 Jan. - 31 Mar. 1968 [NASA-CR-94243] p0048 N68-21879

Solar thermionic generator development Quarterly report, 1 Dec. 1967 - 29 Feb. 1968 [NASA-CR-94402] p0048 N68-22991

Mariner Mars power system optimization study Interim report, 4 Mar. - 31 May 1968 [NASA-CR-95263] p0050 N68-27974

Large area solar array Quarterly report - Phase 2, 1 Mar. - 31 May 1968 [NASA-CR-95999] p0051 N68-31404

Feasibility study 30 watts per pound roll-up solar array Final report [NASA-CR-96230] p0051 N68-32561

Fabrication feasibility study of a 30 watt/pound rollup solar array Final report [NASA-CR-97208] p0052 N68-36630

Spacecraft power p0052 N68-37401

Research and advanced concepts p0207 N68-37410

Results of research on a single-component system for a liquid-metal MHD converter [NASA-CR-97883] p0209 N69-13045

Thermodynamic analysis of new cycles for liquid-metal MHD generators [NASA-CR-97885] p0209 N69-13151

The effective electrical conductivity of a two-phase liquid-metal flow [NASA-CR-97872] p0209 N69-13240

Experimental investigation of an insector device [NASA-CR-97878] p0209 N69-13286

Investigation of two-phase Laval nozzles [NASA-CR-97877] p0209 N69-13287

Experimental investigations on liquid-metal MHD generators [NASA-CR-97879] p0209 N69-13288

Investigation of a liquid-metal jet MHD generator [NASA-CR-97864] p0214 N69-13391

Study of an induction-type liquid-metal MHD generator [NASA-CR-97876] p0214 N69-13818

Six-converter solar thermionic generator Final report, 10 Jan. 1967 - 31 Mar. 1968 [NASA-CR-98712] p0052 N69-14920

Research and advanced concepts p0214 N69-16485

Analysis of a multistage liquid metal magnetohydrodynamic power conversion cycle [NASA-CR-100500] p0217 N69-21376

Magnetohydrodynamic induction machine [NASA-CASE-XNP-07481] p0218 N69-21929

Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jul. - 1 Oct. 1969 [NASA-CR-106379] p0056 N69-40952

Spacecraft power p0231 N70-22862

Applied mechanics p0057 N70-22865

Development of an integrated lightweight flexible silicon solar cell array Quarterly technical report, 1 Jan. - 1 Apr. 1970 [NASA-CR-109527] p0057 N70-25509

Magnetohydrodynamic induction generator experimental study Final technical report [NASA-CR-110154] p0233 N70-29169

Research on the properties of binary liquid metal systems with lithium as one component - The electrical resistivity of liquid lithium saturated with cesium Final report [NASA-CR-110370] p0233 N70-29729

Two-fluid magnetohydrodynamic system and method for thermal-electric power conversion Patent [NASA-CASE-XNP-00644] p0236 N70-36803

Cascaded thermoelectric test generator Final report [NASA-CR-110877] p0238 N70-42733

Development of an integrated lightweight flexible silicon solar cell array Final report [NASA-CR-110913] p0059 N70-43081

Solar cell submodule Patent [NASA-CASE-XNP-05821] p0060 N71-11056

Parametric study of the performance characteristics and weight variations of large-area roll-up solar arrays [NASA-CR-115821] p0060 N71-13427

High temperature lens construction Patent [NASA-CASE-XNP-04111] p0060 N71-15622

Study to determine and improve design for lithium-doped solar cells Quarterly report, 1 Oct. - 31 Dec. 1970 [NASA-CR-116220] p0060 N71-16472

Roll-up solar array Patent [NASA-CASE-NPO-10188] p0061 N71-20273

Lightweight solar panel development [NASA-CR-117349] p0061 N71-20727

Liquid metal MHD power conversion p0241 N71-22560

Design and development of a 66-W/kg 23-in square roll up solar array p0061 N71-22561

Decontamination of petroleum products Patent [NASA-CASE-XNP-03835] p0095 N71-23499

Rollup subsolar array. Volume 2 - Detailed test results Final report [NASA-CR-118006] p0061 N71-23714

Measurements of plasma parameters in a simulated thermionic converter p0245 N72-10852

Considerations with respect to the design of solar photovoltaic power systems for terrestrial applications [NASA-CR-127031] p0064 N72-26034

Neutron radiation characteristics of plutonium dioxide fuel [NASA-CR-127045] p0101 N72-26528

Magnetohydrodynamic generator experimental studies [NASA-CR-127891] p0249 N72-30655

The development, design and test of a 66 W/kg (30-W/lb) roll-up solar array [NASA-CR-128196] p0065 N72-32070

Photovoltaic solar array technology required for three wide scale generating systems for terrestrial applications: rooftop, solar farm, and satellite [NASA-CR-128381] p0065 N72-33061

Feasibility study of a 110 watt per kilogram lightweight solar array system [NASA-CR-130287] p0066 N73-15079

Effects of positive ion implantation into antireflection coating of silicon solar cells [NASA-CR-131090] p0066 N73-19059
Development of gallium arsenide solar cells [NASA-CR-135510] p0068 N73-30977
JOHNS HOPKINS UNIV., BALTIMORE, MD.
Solar cell power systems on US satellites. Part 2 - Satellites designed by the JHU, Applied Physics Laboratory p0056 N70-12695
JOINT PUBLICATIONS RESEARCH SERVICE, ARLINGTON, VA.
Magnetohydrodynamic method of producing electrical energy, part 1 [JPRS-57940-1-PT-1] p0251 N73-16687
Magnetohydrodynamic method of producing electrical energy, part 2 [JPRS-57940-2-PT-2] p0251 N73-16698
Deep-seated heat from the earth [JPRS-59496] p0109 N73-27324
JOINT PUBLICATIONS RESEARCH SERVICE, WASHINGTON, D.C.
Nuclear energy installations and their technical possibilities [JPRS-43265] p0010 N68-10725
Exploratory geophysics in the USSR during the years of Soviet Rule /1917-1967/ p0079 N68-17606
Development of seismic prospecting methods in the USSR p0080 N68-17607
Isotopic electric power sources for radiometeorological stations p0201 N68-21974
Heat regeneration injector design efficiency and slow parameters weighed in MHD installations [JPRS-46752] p0208 N69-11943
The thermodynamics of multistage cycles of MHD installations with heat regeneration p0208 N69-11944
Ionospheric MHD generator [JPRS-46941] p0214 N69-13670
Soviet studies on magnetohydrodynamic generators [JPRS-48041] p0219 N69-26241
Magnetic hydrodynamics of flow in MHD ducts p0219 N69-26242
Calculation of the boundary layer at the electrode of a plane MHD generator p0219 N69-26243
Chemical and physicochemical properties of processes of microbiological oxidation of petroleum hydrocarbons [JPRS-48150] p0084 N69-29789
Working of heliostations described [JPRS-48222] p0054 N69-30038
Terrestrial geophysics p0092 N70-24796
Research in magnetohydrodynamics summarized p0232 N70-28078
Work on magnetohydrodynamics /symposium in the USA/ p0241 N71-26458
Global contamination of the atmosphere by krypton-85 from worldwide nuclear power plants and the radiation danger [JPRS-53174] p0016 N71-26623
Electrode materials based on silicon carbide for open cycle MHD generators p0243 N71-35623
Oxide materials for hot channel of open cycle MHD generator p0243 N71-35627
Thermodynamic efficiency of uranium-hexafluoride MHD-plants [JPRS-55126] p0247 N72-17956

K

KANWER (LEO) ASSOCIATES, REDWOOD CITY, CALIF.
Principles of steel construction engineering in the building and operation of wind driven power plants [NASA-TT-F-14872] p0106 N73-21253
Operating experience obtained with a 100 kW wind power plant [NASA-TT-F-15068] p0111 N73-29008
Project of wind motor with aerodynamic transmission for capacities of 100 kw to 3000 kw [NASA-TT-F-15131] p0111 N73-30976
Superconductive energy storage [NASA-TT-F-15109] p0268 N73-31676

KERNFORSCHUNGSANLAGE, JUELICH (WEST GERMANY).
Applied magnetohydrodynamics, no. 3 [JUL-510-TP] p0201 N68-21331
Some problems of lignite gasification by means of high-temperature nuclear reactor heat [JUL-554-RG] p0264 N69-13298
Applied magnetohydrodynamics. Issue 6 - Parametric studies and dimensioning of noble gas MHD generators [JUL-706-TP] p0242 N71-27918
Applied magnetohydrodynamics. Number 5 - MHD-nuclear power stations [JUL-689-TP] p0242 N71-30458
Applied magnetohydrodynamics. No. 7: Electrical losses in the MHD generator [JUL-742-TP] p0245 N72-11639
Applied magnetohydrodynamics. Volume 11: Outlook and possibility for MHD gas combustion generators with air turbine for nuclear plant application in the BRD [JUL-892-TP-VOL-11] p0254 N73-30699
KERNFORSCHUNGSZENTRUM, KARLSRUHE (WEST GERMANY).
Supplementary material to the report nuclear fuel requirements and costs of various reactor types in Germany, KFK 366 [KFK-466] p0081 N68-22608
Physics investigations of uranium-fueled fast steam-cooled reactors in SNZAK, assemblies 3A-0, 3A-2, 3A-3 [EUFNR-608] p0085 N69-31161
Fast reactor core heat removal [EUFNR-615] p0086 N69-31655
Rod heaters with indirect resistance heating for simulation of nuclear fuel rods [KFK-894] p0230 N70-22247
An approach to compare air pollution of fossil and nuclear power plants [CONF-700810-20] p0016 N71-13756
KYOTO UNIV. (JAPAN).
Research on radioactive dust in the air at KUR operation [KURRI-TR-56] p0091 N70-21010

L

LABOFINA SOCIETE ANONYME, BRUSSELS (BELGIUM).
Fuels for supersonic aircraft p0094 N70-39640
LABORATOIRE CENTRAL DES INDUSTRIES ELECTRIQUES (FRANCE).
Effect of a thermophotovoltaic converter p0199 N68-17829
LANAR-MERFIELD, SANTA MONICA, CALIF.
Geologic information from space photography p0088 N70-14088
LIBRARY OF CONGRESS, WASHINGTON, D.C.
The Federal Government and energy research and development historical background p0021 N73-22928
LINGUISTIC SYSTEMS, INC., CAMBRIDGE, MASS.
Problems concerning automatic connection of an aerogenerator to a network [NASA-TT-F-14873] p0106 N73-21238
LITTLE (ARTHUR D.), INC., CAMBRIDGE, MASS.
Power without pollution p0019 N73-13870
LOBO (WALTER E.), NEW YORK.
Acetylene and low-cost power p0117 N70-14509
LOCKHEED MISSILES AND SPACE CO., HUNTSVILLE, ALA.
The development of a residential heating and cooling system using NASA derived technology [NASA-CR-124063] p0066 N73-17911
LOCKHEED MISSILES AND SPACE CO., PALO ALTO, CALIF.
On the thermodynamics of systems of direct conversion of thermal into electrical energy p0239 N71-13249
LOCKHEED MISSILES AND SPACE CO., SUNNYVALE, CALIF.
The three-index transport problem p0257 N68-14618
SERT 2 solar array Final report [NASA-CR-72706] p0058 N70-28421
Evaluation of space station solar array technology and recommended advanced development programs First topical report [NASA-CR-114828] p0060 N71-16462
Flywheel feasibility study and demonstration [PB-200143] p0266 N72-11410

CORPORATE SOURCE INDEX

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH

Solar energy powered heliostats
[NASA-CASE-GSC-10945-1] p0065 N72-31637
Evaluation of space station solar array technology
[NASA-CR-128533] p0065 N72-33057
Space station solar array technology evaluation
program
[NSC-07163] p0068 N73-30057

LOS ALAMOS SCIENTIFIC LAB., N.MEX.
Energy sources of the future with emphasis on
the light elements
[LA-DC-9519] p0010 N68-28181
Solid solution oxide fuels for space electric
power heat system
[LA-DC-9686] p0264 N69-14302
Energy storage in a superconducting winding
[LA-TR-70-9] p0265 N71-11913
Pu-238 space electric power fuel development
program
[LA-4697] p0097 N72-12617
Energy storage and switching with superconductors
[LA-DC-12990] p0267 N72-17829
Laser activation of solar cells
[LA-DC-72-468] p0065 N73-12061

LTV AEROSPACE CORP., HAMPTON, VA.
A fuel conservation study for transport aircraft
utilizing advanced technology and hydrogen fuel
[NASA-CR-112204] p0102 N73-11019

LUCAS GAS TURBINE EQUIPMENT, LTD., BURNLEY (ENGLAND).
Fuel related problems in aircraft fuel systems
p0097 N72-11677

M

MAGNETIC CORP. OF AMERICA, CAMBRIDGE, MASS.
Lightweight superconducting MHD magnets. Volume
1: Saddle magnet design, construction and
preliminary test results
[AD-745321] p0249 N73-10247
Lightweight superconducting MHD magnets. Volume
2: 10 MW level magnet system design and
projections for future development
[AD-745322] p0250 N73-11717

MAGNETIC CORP. OF AMERICA, WALTHAM, MASS.
Development of pulsed high energy inductive
energy storage systems, volume 1
[AD-755359] p0267 N73-23014
Development of pulsed high energy inductive
energy storage systems. Volume 3: Weight
optimization for energy storage, coil, cryogen
and dewar
[AD-755360] p0267 N73-26054

MARTIN CO., BALTIMORE, MD.
SNAP 19, phase 3. Volume 3 - Generator
developmental aspects Final report
[MND-3607-239-3, v. 3] p0207 N68-37951

MARYLAND UNIV., COLLEGE PARK.
Response characteristics of a thermal-heliostats
solar-array orientation device
p0063 N72-13396
An assessment of solar energy as a national
energy resource
[NASA-CR-133101] p0068 N73-26818

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
Thermodynamics of thermionic energy conversion
p0196 N68-17805
P-i-n structures for controlled spectrum
photovoltaic converters
p0199 N68-17830
Plasmas and controlled nuclear fusion
p0209 N69-13069
The spread of oil slicks on a calm sea
p0257 N70-10537
Activities concerning electrical, thermal, and
optical properties of semiconductors related
to energy conversion Final technical report,
15 Jun. 1958 - 30 Nov. 1969
[AD-693235] p0056 N70-11427
Effective stack heights for tall stacks
[FNL-PUBL-71-14] p0098 N72-16934
Research on nonequilibrium MHD generators
[AD-740572] p0248 N72-29734
Reward and uncertainty in exploration programs
[NASA-CR-129595] p0103 N73-13991
Two stochastic models useful in petroleum
exploration
[NASA-CR-129611] p0103 N73-13992
Some problems and prospects for marine
transportation of oil in the 1970s
[NASA-CR-133854] p0258 N73-30464

MCDONNELL-DOUGLAS ASTRONAUTICS CO., HUNTINGTON
BEACH, CALIF.
Electrical power distribution and usage
p0258 N71-20975

MCDONNELL-DOUGLAS CORP., HUNTINGTON BEACH, CALIF.
Parametric study of space power systems. Volume
2 - Technical report Final report
[NASA-CR-73280] p0214 N69-14760

MCDONNELL-DOUGLAS CORP., LONG BEACH, CALIF.
Economic analysis of the use of gelled fuels in
jet transport aircraft Final report
[FAA-WA-70-45] p0093 N70-34002

MCCLROY (RALPH) CO., AUSTIN, TEX.
Energy storage in a superconducting winding
[LA-TR-70-9] p0265 N71-11913

HELPER, INC., FALLS CHURCH, VA.
The design and development of a low temperature
balloon battery Phase 1 final report, 22 May
- 5 Aug. 1968
[NASA-CR-73711] p0053 N69-16975

MICHIGAN UNIV., ANN ARBOR.
Further infrared systems studies for the earth
resources program Final report
[NASA-CR-102111] p0089 N70-16407

MINISTERE DE L'AIR, PARIS (FRANCE).
Contribution to the study of the oxygen electrode
p0260 N68-18025

MINISTERULUI PETROLULUI, PLOESTI (ROMANIA).
Nuclear techniques currently used in oil field
exploitation
[SH-112/24] p0084 N69-30799

MINNESOTA MINING AND MFG. CO., ST. PAUL.
SNAP-21 program. Phase 2 - Deep sea
radioisotope-fueled thermoelectric generator
power supply system Quarterly report, Apr. 1
- Jun. 31, 1967
[MMM-3691-20] p0191 N68-11382
Five six zero-watt portable thermoelectric power
module Final report
[AD-662770] p0193 N68-15230
Deep sea radioisotope-fueled thermoelectric
generator power supply system. SNAP-21
program, phase 2 - 10-watt system Final
summary report
[MMM-3691-62] p0239 N71-15039

MITRE CORP., MCLEAN, VA.
A survey of propulsion systems for low emission
urban vehicles
[PB-200144] p0097 N72-10830
Energy, resources and the environment
[PB-213031] p0020 N73-20820

US transportation: Some energy and environmental
considerations
[PB-213034] p0020 N73-20991

MOBIL RESEARCH AND DEVELOPMENT CORP., DALLAS, TEX.
Advances in nuclear geophysical methods in oil
geology and rock analysis
[SK-112/25] p0085 N69-30800

MONSANTO RESEARCH CORP., EVERETT, MASS.
Five-kilowatt hydrazine/air fuel cell modules
Final technical report, 9 Apr. 1965 - 24 Jul.
1966
[MRB4026F] p0191 N68-11503

MOUND LAB., MIAMISBURG, OHIO.
Criticality analysis of the large heat source
system containing plutonium 238 dioxide fuel
[MLM-1532] p0082 N69-15081

N

NAPLES UNIV. (ITALY).
Generalized Saha equation for non-equilibrium
two temperature plasmas
p0197 N68-17813

NATIONAL ACADEMY OF SCIENCES - NATIONAL RESEARCH
COUNCIL, WASHINGTON, D.C.
Energy systems of extended endurance in 1-100
kilowatt range for undersea applications
[AD-681068] p0217 N69-20548
Useful applications of earth-oriented satellites
- Geology
[NASA-CR-101384] p0084 N69-28160
Seismology - Responsibilities and requirements
of a growing science. Part 1 - Summary and
recommendations
[NASA-CR-107020] p0087 N70-12263
Solar cells: Outlook for improved
efficiency
[NASA-CR-127234] p0064 N72-27055

The panel's report
p0064 N72-27056

An introduction to the physics of solar cells
p0064 N72-27057

Theoretical efficiency considerations for photovoltaic energy converters
p0249 N72-27058

The fundamentals of improved silicon solar-cell performance
p0064 N72-27059

Solar energy in developing countries: Perspectives and prospects
[PB-208550]
p0064 N72-31092

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. AMES RESEARCH CENTER, MOFFETT FIELD, CALIF.

Solar cell Patent
[NASA-CASE-ARC-10050]
p0062 N71-33409

Structural weight analysis of hypersonic aircraft
[NASA-TN-D-6692]
p0118 N72-18911

Economic study of future aircraft fuels (1970-2000)
p0102 N72-32742

Solid medium thermal engine
[NASA-CASE-ARC-10461-1]
p0252 N73-20931

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. GODDARD SPACE FLIGHT CENTER, GREENBELT, MD.

A computer program to determine the effect of charged-particle irradiation on solar-cell output power
[NASA-TM-X-63559]
p0054 N69-27843

Review of liquid-metal magnetohydrodynamic energy conversion cycles
[NASA-TM-X-63671]
p0224 N69-37703

Switching mechanism with energy storage means Patent
[NASA-CASE-XGS-00473]
p0265 N70-38713

The generation of pollution free electrical power from solar energy
[NASA-TM-X-65497]
p0061 N71-23700

Results from the ATS 3 reflectometer experiment
p0061 N71-25311

Fifth Aerospace Mechanisms Symposium
[NASA-SP-282]
p0018 N72-13391

Energy in the environment and the second law of thermodynamics
[NASA-TM-X-65912]
p0019 N72-26971

Significant Accomplishments in Sciences: Goddard Space Flight Center, 1972
[NASA-SP-331]
p0021 N73-31867

Energy conservation alternatives to nuclear power, a case study
[NASA-TM-X-70468]
p0022 N73-31990

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LANGLEY RESEARCH CENTER, LANGLEY STATION, VA.

The geometric properties of an expandable whirling-membrane solar-energy concentrator
[NASA-TN-D-4532]
p0048 N68-22258

Performance of an expandable whirling membrane solar energy concentrator
[NASA-TM-X-59872]
p0049 N68-27564

Review of solar concentrator technology
[NASA-TM-X-59043]
p0049 N68-27643

Performance of an expandable whirling membrane solar energy concentrator
[L-5484]
p0049 N68-27926

Calorimetric, optical, and vibration investigations of stretch-formed aluminum solar concentrators
[NASA-TN-D-4889]
p0052 N69-10708

Calorimetric evaluation of two cone-column solar-energy concentrators
[NASA-TN-D-5109]
p0053 N69-21088

Calorimetric evaluation of three 1.5-meter-diameter inflatable rigidized solar concentrators
[NASA-TN-D-5234]
p0054 N69-28123

Geometric properties of a modified whirling-membrane solar-energy concentrator
[NASA-TN-D-5859]
p0058 N70-29807

Crossed-field MHD plasma generator/accelerator Patent
[NASA-CASE-XLA-03374]
p0239 N71-15562

Self-repeating plasma generator having communicating annular and linear arc discharge passages Patent
[NASA-CASE-XLA-03103]
p0240 N71-21693

Power and load priority control concept for a Brayton cycle power system
[NASA-TN-D-6476]
p0244 N71-36052

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION. LEWIS RESEARCH CENTER, CLEVELAND, OHIO.

Parametric analysis of radioisotope cascaded thermoelectric generators
[NASA-TM-X-1501]
p0192 N68-14585

Parametric analysis of radioisotope thermoelectric generators
[NASA-TM-X-1453]
p0193 N68-14630

Design and performance of two vacuum chambers and solar simulators for solar-cell research
[NASA-TM-X-1503]
p0047 N68-16695

Analysis of the maximum performance of a paraboloidal solar collection system for space power
[NASA-TN-D-8415]
p0047 N68-18998

Criteria for use of Rankine-MHD systems in space
[NASA-TM-X-52191]
p0200 N68-19019

Nuclear thermionic space power system concept employing heat pipes
[NASA-TN-D-4299]
p0200 N68-19146

Reactivity effects caused by radial power flattening in a small, fast-spectrum reactor
[NASA-TN-D-4459]
p0080 N68-19925

Tankage systems for a methane-fueled supersonic transport
[NASA-TM-X-1591]
p0081 N68-23895

Energy required for proton production by electron impact in mixtures of atomic and molecular hydrogen
[NASA-TM-X-52344]
p0116 N68-24657

Nuclear reactor space power conversion systems
[NASA-TM-X-52472]
p0204 N68-29921

Experimental evaluation of a voltage regulator-exciter for a 15 kilovolt-ampere Brayton cycle alternator
[NASA-TN-D-4697]
p0204 N68-29960

Preliminary analysis of a titanium alloy honeycomb solar absorber having blackened walls
[NASA-TM-X-4727]
p0050 N68-30751

Flat plate thermoelectric generators for solar probe missions
[NASA-TM-X-52451]
p0050 N68-31018

Development of a 1200-hertz alternator and controls for space power systems
[NASA-TM-X-52453]
p0205 N68-31042

2 to 10 kilowatt solar or radioisotope Brayton power system
[NASA-TM-X-52438]
p0051 N68-31096

A SNAP-8 breadboard system. Operating experience.
[NASA-TM-X-61161]
p0264 N68-33238

Design and preliminary operation of the Lewis magnetohydrodynamic generator facility
[NASA-TN-D-4867]
p0207 N68-37259

Transient solidification outside a cooled pipe with application to a solar Brayton heat receiver
[NASA-TN-D-4897]
p0052 N69-10227

Nuclear reactor heat sources for future power generation
p0012 N69-12576

Topics on Rankine cycle power systems technology
p0208 N69-12577

Brayton cycle systems
p0208 N69-12578

Direct energy conversion
p0208 N69-12585

Summary of conference
p0012 N69-12586

Comparison of Brayton and Rankine cycle magnetohydrodynamic space-power generation systems
[NASA-TN-D-5085]
p0217 N69-20852

Electrothermal instabilities in the entrance region of an MHD generator
[NASA-TM-X-1761]
p0217 N69-20875

Solar absorptances and spectral reflectances of 12 metals for temperatures ranging from 300 to 500 K
[NASA-TN-D-5353]
p0055 N69-31895

The potential of nuclear power for high-speed ocean-going air-cushion vehicles
[NASA-TM-X-1871]
p0013 N69-35723

Analytical and experimental studies of MHD generator cathodes emitting in a "spot" mode
[NASA-TN-D-5414]
p0224 N69-35732

Effect of electrothermal instabilities on Brayton- and Rankine-cycle magnetohydrodynamic space-power generation systems
[NASA-TN-D-5461]
p0224 N69-37883

CORPORATE SOURCE INDEX

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,

Triode thermionic energy converter
[NASA-CASE-XLE-01015] p0225 N69-39898
Slugg flow magnetohydrodynamic generator
[NASA-CASE-XLE-02083] p0225 N69-39983
Study of a 300-kilowatt Rankine-cycle advanced
nuclear-electric space-power system
[NASA-TN-X-1919] p0226 N70-11975
Comparison of ASTM-A1 and natural gas fuels in
an annular turbojet combustor
[NASA-TN-X-52700] p0087 N70-12102
Turbine performance in a gas-bearing Brayton
cycle turboalternator
[NASA-TN-D-5604] p0227 N70-14220
Experimental performance of a 2-15 kilowatt
Brayton power system in the Space Power
Facility using krypton
[NASA-TN-X-52750] p0229 N70-19190
Nuclear power for manned orbiting space stations
[NASA-TN-X-52774] p0231 N70-25446
High voltage generation with a beta
electrogenerator cell
[NASA-TN-X-52776] p0232 N70-26116
Description and evaluation of digital-computer
program for analysis of stationary outside-
coil Lundell alternators
[NASA-TN-D-5814] p0233 N70-28433
Startup testing of the SNAP-8 power conversion
system
[NASA-TN-X-52822] p0233 N70-29864
Energy conversion apparatus Patent
[NASA-CASE-XLE-00212] p0235 N70-34134
Device for directionally controlling
electromagnetic radiation Patent
[NASA-CASE-XLE-01716] p0059 N70-40234
Thermal feasibility of using methane or hydrogen
fuel for direct cooling of a first-stage
turbine-stator
[NASA-TN-D-6042] p0117 N70-42326
Survey of materials for thermionic converters
[NASA-TN-X-2130] p0238 N71-11689
Transfer function determination of the primary
loop of a conceptual nuclear Brayton space
powerplant
[NASA-TN-X-2193] p0240 N71-17933
Operating characteristics of the primary flow
loop of a conceptual nuclear Brayton space
powerplant
[NASA-TN-X-2161] p0240 N71-18866
Cryogenic fuels for aircraft
p0118 N71-19463
SEPT 2 spacecraft electrical power system
[NASA-TN-X-2234] p0061 N71-20471
Conversion of an experimental turbojet combustor
from ASTM A-1 fuel to natural gas fuel
[NASA-TN-X-2241] p0094 N71-20533
Thermal cycling test of a flexible solar cell
module
[NASA-TN-X-52995] p0061 N71-21206
The potential of nuclear MHD electric power
systems
[NASA-TN-X-67829] p0241 N71-24578
Use of an air-assist fuel nozzle to reduce
exhaust emissions from a gas turbine combustor
at simulated idle conditions
[NASA-TN-D-6404] p0096 N71-31456
The performance of helium seeded with uranium in
a magnetohydrodynamic generator
p0243 N71-33663
Analysis of a 35- to 150-kilowatt Brayton
power-conversion module for use with an
advanced nuclear reactor
[NASA-TN-D-6525] p0243 N71-35233
Combined turbine-magnetohydrodynamic Brayton
cycle power system for space and ground use
[NASA-TN-D-6513] p0244 N71-36450
What can nuclear energy do for society?
[NASA-TN-X-67963] p0017 N72-11844
Integrated thermoelectric generator/space
antenna combination
[NASA-CASE-XER-09521] p0246 N72-12136
Status of power generation experiments in the
NASA Lewis closed cycle MHD facility
[NASA-TN-X-67975] p0246 N72-12166
Large-scale terrestrial solar cell power
generation cost: A preliminary assessment
[NASA-TN-X-2520] p0063 N72-19057
Solar array cost reduction
[NASA-TN-X-68035] p0063 N72-21033

An out-of-core thermionic-converter system for
nuclear space power
[NASA-TN-X-68049] p0247 N72-23675
The effect of wall friction on
magnetohydrodynamic generator performance
[NASA-TN-D-6804] p0247 N72-24755
Cost study of solar cell space power systems
[NASA-TN-X-68054] p0063 N72-25022
The diiminide: A research and development tool
for nuclear thermionics
[NASA-TN-X-2586] p0248 N72-28685
Lewis Research Center earth resources program
p0101 N72-29317
Aircraft engine pollution reduction
[NASA-TN-X-68129] p0102 N72-32754
Tables of critical-flow functions and
thermodynamic properties for methane and
computational procedures for both methane and
natural gas
[NASA-SP-3074] p0104 N73-15309
Emerging needs for mobile nuclear powerplants
[NASA-TN-X-68164] p0020 N73-15693
Comparison of combustion characteristics of ASTM
A-1, propane, and natural-gas fuels in an
annular turbojet combustor
[NASA-TN-D-7135] p0104 N73-16771
Performance gains by using heated natural-gas
fuel in an annular turbojet combustor
[NASA-TN-X-2742] p0105 N73-18960
Air-cushion tankers for Alaskan North Slope oil
[NASA-TN-X-2683] p0258 N73-18981
Preliminary appraisal of hydrogen and methane
fuel in a Mach 2.7 supersonic transport
[NASA-TN-X-68222] p0020 N73-22711
The utilization of solar energy to help meet our
nation's energy needs
[NASA-TN-X-68230] p0067 N73-22748
The use of hydrogen for aircraft propulsion in
view of the fuel crisis
[NASA-TN-X-68242] p0021 N73-24777
Flat-plate collector performance evaluation.
The case for a solar simulation approach
[NASA-TN-X-71427] p0068 N73-32655
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.
LYNDON B. JOHNSON SPACE CENTER, HOUSTON, TEX.
Power generation and cryogenic gas storage
systems study for post AAP 1-4 manned missions
[NASA-TN-X-61072] p0048 N68-23182
Fuel cell technology program
p0237 N70-40974
Reliability techniques in the petroleum industry
p0100 N72-25986
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION.
MARSHALL SPACE FLIGHT CENTER, HUNTSVILLE, ALA.
Space vehicle missile power supplies Annotated
bibliography
[NASA-TN-X-60877] p0195 N68-17223
Problems of increasing the reliability of
automatic mining equipment
[NASA-TN-X-61123] p0081 N68-25716
Power systems research at MSFC
p0215 N69-18068
Thermal system design
p0057 N70-22907
Power system design, appendix E
p0057 N70-22921
Proceedings - Space Transportation System
Propulsion Technology Conference. Volume 3 -
Auxiliary power unit and air breathing
propulsion
p0095 N71-29603
Applicability of NASA contract quality
management and failure mode effect analysis
procedures to the USGS' Outer Continental Shelf
oil and gas lease management program
[NASA-TN-X-2567] p0109 N72-25955
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION,
WASHINGTON, D.C.
Electrochemical space power sources
[NASA-TN-X-60795] p0263 N68-14818
Motion of conducting bodies in a magnetic field
[NASA-TT-F-460] p0194 N68-16286
State of the theory of magnetohydrodynamic
induction machines with working media of
liquid metal
p0194 N68-16287
Electromagnetic processes in an ideal, induction
MHD machine
p0194 N68-16288

- Higher spatial harmonics of the magnetic field of an induction MHD machine p0194 N68-16289
- Transverse edge effect in plane induction magnetohydrodynamic machines p0194 N68-16290
- Longitudinal edge effect in linear induction MHD machines p0194 N68-16291
- Ponderomotive forces acting upon conductive bodies in the traveling magnetic field of a cylindrical inductor p0195 N68-16292
- Thermodynamics and applications of bioelectrochemical energy conversion systems p0199 N68-17826
- Electric power generation in space [NASA FACTS-WF-38] p0048 N68-19128
- Investigation of the thermal stability of the microsurface of astronomical mirrors fabricated from AM96L alloy with chromium and nickel coatings [NASA-TT-P-11659] p0048 N68-22401
- Future applications for static energy conversion devices p0203 N68-28748
- High temperature energy systems with plasma reactors and inductive magnetoplasma-dynamic converters [NASA-TT-P-11825] p0205 N68-30811
- Solar cells [NASA FACTS S-6/3-68] p0051 N68-31526
- Electrochemical space power sources p0229 N70-16227
- Closed-cycle magnetohydrodynamic power generation p0229 N70-18728
- Plasma heating and containment p0229 N70-18729
- High-power, long-life electrical generating systems for lunar base missions p0237 N70-39278
- Reliability analysis of the solar generator of the ESRO 1 satellite [NASA-TT-P-14498] p0065 N73-10051
- NATIONAL AIR POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D.C.
Control techniques for sulfur oxide air pollutants [PB-190254] p0015 N70-34670
- NATIONAL BUREAU OF STANDARDS, BOULDER, COLO.
Survey of current information on LNG and methane and measurements of the thermophysical properties of compressed fluid methane Annual progress report [NBS-9781] p0095 N71-22717
- NATIONAL LENDING LIBRARY FOR SCIENCE AND TECHNOLOGY, BOSTON SPA (ENGLAND).
The future development of energetics [M-7428] p0011 N68-35752
- The uranium/thorium cycle programme [NLL-RISLEY-TRANS-1783-/9091.9F] p0091 N70-20121
- Leak testing of containers and capsules for radioactive materials [NLL-RISLEY-TRANS-1865-/9091.9F] p0091 N70-20349
- Continuous testing in the Marcoule plant [NLL-RISLEY-TRANS-1866-/9091.9F] p0091 N70-20596
- New absorbents and classification of methods of removing sulphur dioxide from industrial cases [NRL-RTS-5464] p0091 N70-20779
- Development of oxide system fuels [NLL-DOUNRE-TRANS-419-/9091.9F] p0091 N70-21080
- Investigations into the dynamics of a nuclear closed-cycle gas turbine plant with high temperature reactor [NLL-WH-TRANS-271-/9091.9F] p0230 N70-21100
- Comparison of the economics of reprocessing by dry and wet methods in the framework of the fuel cycle of breeder reactors [NLL-WINDSCALE-TRANS-414-/9091.9F] p0232 N70-26388
- Prognosis of the world energy supply between now and the year 2000 with reference to the quantity of energy raw materials consumed [NLL-TRANS-1166-(9022.9)] p0096 N71-35501
- The rate of oxidation of petroleum products in water without addition of nitrogen [NLL-NSTIC-TRANS-2474-(6180.59)] p0097 N71-37701
- The dawn of solar metallurgy [NLL-M-22830-(5828.4F)] p0067 N73-20584
- NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO).
Present status of electric automobiles p0266 N71-22199
- NATIONAL SCIENCE FOUNDATION, WASHINGTON, D.C.
An inventory of energy research, volume 1 [ORNL-EIS-72-18-VOL-1] p0018 N72-25635
- NAVAL AIR ENGINEERING CENTER, PHILADELPHIA, PA.
Ground support equipment: Low pollutant fuels [AD-755151] p0106 N73-20815
- NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.
The identification of naval fuels and natural fluorophors in sea water by fluorescence spectrometry [AD-743703] p0102 N72-33736
- NAVAL RADIOLOGICAL DEFENSE LAB., SAN FRANCISCO, CALIF.
Radioisotopic power generators State of the art report [AD-687131] p0223 N69-32804
- NAVAL RESEARCH LAB., WASHINGTON, D.C.
Controlled thermonuclear reactions - An ocean of energy [AD-691465] p0225 N69-40792
- The remote sensing of oil slicks by radar [AD-709982] p0258 N70-42226
- Radar monitoring of oil pollution p0097 N72-12311
- NAVAL SCIENTIFIC AND TECHNICAL INFORMATION CENTRE, LONDON (ENGLAND).
The determination of sulphur in petroleum products [NSTIC/13106/67] p0079 N68-15630
- NAVAL SHIP ENGINEERING CENTER, WASHINGTON, D.C.
The 7th Annual Technical Symposium - A closed Brayton cycle power plant for underwater applications and comparison with a fuel cell [AD-709387] p0238 N70-42951
- NAVAL SHIP RESEARCH AND DEVELOPMENT CENTER, ANNAPOLIS, MD.
High-power density hydrazine fuel cells [AD-764530] p0255 N73-33009
- NAVY DEPT., WASHINGTON, D.C.
The atomic industry [NIC-TRANS-2653] p0011 N68-38243
- NAVY SPACE SYSTEMS ACTIVITY, LOS ANGELES, CALIF.
Space power supply study Final report [NSSA-R40-68-5] p0206 N68-35232
- Space electrical power systems for the mid-1970's Final technical report [AD-701352] p0233 N70-29518
- NEW MEXICO UNIV., ALBUQUERQUE.
Activities of Technology Application Center Quarterly status report, Jul. - Sep. 1969 [NASA-CR-107560] p0089 N70-15491
- Heat pipe technology: A bibliography with abstracts [NASA-CR-135953] p0258 N73-33900
- Heat pipe technology [NASA-CR-135956] p0258 N73-33901
- Heat pipe technology: A bibliography with abstracts [NASA-CR-135955] p0259 N73-33902
- Heat pipe technology: A bibliography with abstracts [NASA-CR-135952] p0259 N73-33903
- Heat pipe technology: A bibliography with abstracts [NASA-CR-135951] p0259 N73-33904
- NEW YORK STATE UNIV., ALBANY.
To evaluate ERTS-A data for usefulness as geological sensor [E72-10020] p0101 N72-29272
- NEWCASTLE UNIV. (ENGLAND).
Non-equilibrium modes of MHD-converters p0197 N68-17811
- NORTH AMERICAN ROCKWELL CORP., CANOGA PARK, CALIF.
Basic research in thermionic energy conversion Technical summary report, 1 Aug. 1968 - 30 Nov. 1969 [AD-700945] p0232 N70-26987
- NORTH AMERICAN ROCKWELL CORP., LOS ANGELES, CALIF.
Frontiers of technology study. Volume 3 - Implementation [PB-178272] p0011 N68-31690
- Frontiers of technology study. Volume 2 - Survey [PB-178271] p0011 N68-31703

NORTHEASTERN RADIOLOGICAL HEALTH LAB., WINCHESTER, MASS.

Investigation of a nuclear fuel reprocessing plant upon its environment p0095 N71-29878

NORTHEASTERN UNIV., BOSTON, MASS.

Research in energy conversion Final report, 1 Oct. 1963 - 30 Sep. 1966 p0200 N68-21051
[APCRL-67-0512]
Investigations in thermionic and photovoltaic energy conversion p0200 N68-21052

NORTHWESTERN UNIV., EVANSTON, ILL.

The diagnostics of plasmas p0196 N68-17809

ROSSMAN, WATERS, SCOTT, KRUEGER, AND RIORDAN, LOS ANGELES, CALIF.

Study of outer continental shelf lands of the United States. Volume 1 - Introduction, chapters 1 and 2 p0014 N70-25747
[PB-1887141]

Study of outer continental shelf lands of the United States. Volume 2 - Chapters 3 through 7 [PB-188715] p0014 N70-25748

Study of outer continental shelf lands of the United States. Volume 3 - Chapters 8 through 12 [PB-188716] p0014 N70-25749

Study of outer continental shelf lands of the United States. Volume 4 - Appendices [PB-188717] p0015 N70-25750

Study of outer continental shelf lands of the United States. Volume 5 - Appendices [PB-188718] p0015 N70-25751

Study of outer continental shelf lands of the United States. Volume 6 - Appendices [PB-188719] p0015 N70-25752

NOWAK (K.), VIENNA (AUSTRIA).

Project for obtaining controlled nuclear fusion. A new system that should lead to rapid practical use for energy production by controlled nuclear fusion p0019 N73-12707
[NP-19152]

WUKLBAR-CHEMIE UND -METALLURGIE, G.M.B.H., WOLFGANG BEI HANAU (WEST GERMANY).

Technological improvement in the fabrication of cast uranium carbide rods Final report [EUR-4273.D] p0086 N69-34967

**OAK RIDGE NATIONAL LAB., TENN.**

A survey of equilibrium fuel-cycle costs for a low-enriched, unclad, helium-cooled UO₂-graphite reactor [ORNL-TM-1789] p0078 N68-12420

Comparative evaluation of sol-gel fuel fabrication costs [ORNL-TM-1979] p0078 N68-12553

Heat transfer limitations for dynamic converters p0195 N68-17797

Trend in atomic power generation and uranium resources [ORNL-TR-1825] p0081 N68-28954

On the feasibility of power by nuclear fusion [ORNL-TM-2204] p0204 N68-30162

Fuel-cycle cost comparisons for low enriched uranium high temperature gas-cooled reactors [ORNL-TM-2173] p0083 N69-17558

Diffusion process for removing tritium from the blanket of a thermonuclear reactor [ORNL-TM-2358] p0083 N69-19229

Coated-particle fuels [ORNL-4324] p0083 N69-19605

Reactor evaluation studies p0087 N69-37567

Safety studies of fuel transport p0257 N69-37570

Physics, thermal hydraulic, and fuel cycle cost analyses of a metallic uranium direct replacement for PWR'S [ORNL-TM-2493] p0088 N70-12423

Rationale for low cost nuclear heat and electricity p0014 N70-14505

Energy intensive and heat intensive processes for a nuclear energy center p0014 N70-14506

The economics of hydrogen and oxygen production by water electrolysis and competitive processes p0117 N70-14511

Space heating in urban environments p0227 N70-14518

Application of low-cost energy to processing of sewage water for reuse p0014 N70-14519

Stability of Tokamaks [ORNL-TM-2766] p0230 N70-19953

A study of metallic uranium fueled pressurized water reactors for the production of process heat or electric power [ORNL-TM-2451] p0232 N70-25646

Isotopes kilowatt program. Task 1 - Conceptual design and evaluation [ORNL-TM-2366] p0233 N70-29364

Preliminary appraisal of the hazards problems of a D-T fusion reactor power plant [ORNL-TM-2822] p0015 N70-37097

Sr 90 heat sources [ORNL-IIC-36] p0096 N71-35815

Isotopic electric generators [ORNL-TR-2485] p0244 N71-37044

The environment and technology assessment [ORNL-NSP-EP-3] p0017 N72-11848

ROD: A nuclear and fuel cycle analysis code for circulating fuel reactors [ORNL-TM-3359] p0098 N72-17737

An inventory of energy research, volume 1 p0018 N72-23948

ORNL isotopic power fuels [ORNL-4750] p0100 N72-24703

An inventory of energy research, volume 1 [ORNL-EIS-72-18-VOL-1] p0018 N72-25635

An inventory of energy research p0018 N72-25931

Cm-244: A radioisotopic power fuel [CONF-720519-1] p0103 N73-12717

OFFICE NATIONAL D'ETUDES ET DE RECHERCHES AEROSPATIALES, PARIS (FRANCE).

Limitations of solar collectors for converters p0047 N68-17804

Germanium solar photoelectric cells. 1 - Experimental study of photovoltaic cells at high flux densities p0050 N68-28746

OFFICE OF NAVAL RESEARCH, ARLINGTON, VA.

Superconducting technology in Japan [AD-727094] p0244 N71-38510

OFFICE OF NAVAL RESEARCH, LONDON (ENGLAND).

Seventh International Power Sources Symposium, Brighton, Sussex, 15-17 September 1970 [AD-718833] p0016 N71-23353

The 5th International Conference on Magneto-hydrodynamic electrical power generation [AD-730450] p0247 N72-15235

OFFICE OF NAVAL RESEARCH, WASHINGTON, D.C.

Some aspects of Japanese energy-conversion research and development [AD-739325] p0248 N72-27067

OHIO DEPT. OF ECONOMIC AND COMMUNITY DEVELOPMENT, COLUMBUS.

Relevance of ERTS to the State of Ohio [E72-10259] p0102 N73-12358

Resource management implications of ERTS-1 data to Ohio [PAPER-R3] p0110 N73-28361

OHIO STATE UNIV., COLUMBUS.

Ecological effects of strip mining in Ohio [E72-10256] p0102 N73-12356

Effects of positive ion implantation into antireflection coating of silicon solar cells [NASA-CR-131090] p0066 N73-19059

OHIO UNIV., ATHENS.

Mapping of soil banks using ERTS-1 pictures p0110 N73-28372

OKLAHOMA STATE UNIV., STILLWATER.

A system for the economic analysis of balanced energy conversion and storage systems p0264 N69-15054

OKLAHOMA UNIV., NORMAN.

Conceptual design of a five kW radioisotope-fueled power system for terrestrial applications p0238 N71-11062

P

PENNSYLVANIA STATE UNIV., UNIVERSITY PARK.
 The use of ERTS-1 MSS data for mapping strip mines and acid mine drainage in Pennsylvania
 [PAPER-E3] p0110 N73-28267
 Identification and mapping of coal refuse banks and other targets in the anthracite region
 [PAPER-L24] p0110 N73-28319
 Mapping of anthracite refuse
 [E73-11107] p0112 N73-33264
 Acid mine drainage and strip mines
 [E73-11112] p0112 N73-33269

PENNSYLVANIA UNIV., PHILADELPHIA.
 Solar collection limitations for dynamic converters
 p0047 N68-17795
 Prospects for thermal energy storage
 p0263 N68-17798
 Electrochemical catalysis
 p0199 N68-17823
 Research in the conversion of various forms of energy by unconventional techniques Status report
 [NASA-CR-93979] p0010 N68-21035
 Research in the conversion of various forms of energy by unconventional techniques Status report for period ending 30 Jun. 1968
 [NASA-CR-97473] p0207 N69-10111
 Studies in fundamental chemistry of fuel cell reactions Semiannual progress report, 1 Jan. - 30 Jun. 1968
 [NASA-CR-100892] p0219 N69-25396
 Institute for direct energy conversion Status report
 [NASA-CR-103989] p0223 N69-34810
 Plasma engineering
 p0223 N69-34812
 Electrochemical engineering
 p0223 N69-34813
 Research for the improvement of silicon solar cell efficiency
 [NASA-CR-121751] p0062 N71-34042
 Conservation and better utilization of electric power by means of thermal energy storage and solar heating
 [PB-210359] p0065 N73-10976

PHILLIPS SCIENTIFIC CORP., BARTLESVILLE, OKLA.
 Investigation of Navy aircraft fuel dispensing methods
 [AD-748211] p0267 N73-13997

PISA UNIV. (ITALY).
 Simple solutions of the helicopter propulsion system made possible using closed cycle for the working fluid
 p0218 N69-23998
 Low emission fuels and devices for aviation engines
 p0097 N72-11675

POLITECNICO DI MILANO (ITALY).
 A method for preliminary analysis of MHD generator performance
 p0252 N73-19951

POLITECNICO DI TORINO (ITALY).
 Thermodynamics of thermoelectric conversion
 p0198 N68-17819
 Possibilities and problems of gas turbine application for ground motion machines
 [PUBL-18] p0227 N70-13927

PRATT AND WHITNEY AIRCRAFT, EAST HARTFORD, CONN.
 Five hundred-watt indirect hydrocarbon-air fuel cell systems Midterm report, 10 Apr. - 9 Sep. 1967
 [PWA-3211] p0200 N68-20884
 Research on the properties of binary liquid metal systems with lithium as one component - The electrical resistivity of liquid lithium saturated with cesium Final report
 [NASA-CR-110370] p0233 N70-29729
 A 1.5 kw fuel cell powerplant
 [AD-730796] p0246 N72-14040
 Fuel cell technology program contract summary report
 [NASA-CR-128519] p0249 N72-30029

PRATT AND WHITNEY AIRCRAFT, WEST PALM BEACH, FLA.
 Effect of fuel zoning and fuel nozzle design on pollution emissions at ground idle conditions for a double-annular ram-induction combustor
 [NASA-CR-121094] p0104 N73-17916

PRINCETON UNIV., N.J.
 A cursory look at Tokamak fusion reactors
 [MATT-659] p0218 N69-23954
 Aerospace systems and mission analysis research - Solar electric space mission analysis Final report
 [NASA-CR-106089] p0055 N69-38783
 Consideration of power requirement in fusion feasibility experiment
 [MATT-803] p0246 N72-11641

PURDUE UNIV., LAFAYETTE, IND.
 Thermodynamics of MHD energy conversion
 p0197 N68-17810
 Fast reactor blanket management
 p0086 N69-31987
 Lifetime consideration and economic evaluation of a large, fast, breeder, mixed fuel cycle system
 p0230 N70-22218

R

RADIO CORP. OF AMERICA, LANCASTER, PA.
 Solar thermoelectric generator design and panel development program
 [NASA-CR-72340] p0046 N68-12252

RADIO CORP. OF AMERICA, PRINCETON, N.J.
 Review and evaluation of past solar cell development efforts Semiannual report, Jun. 1 - Nov. 30, 1967
 [NASA-CR-92679] p0047 N68-16882
 Multi-kilowatt solar cell power - Its critical technology and hardware development
 [NASA-CR-94551] p0049 N68-23528
 Connector strips-positive, negative and T tabs
 [NASA-CASE-XGS-01395] p0053 N69-21539
 Study of power supply configurations for advanced Nimbus missions Final report, 30 Apr. 1968 - 31 Jan. 1969
 [NASA-CR-100529] p0053 N69-22175
 Nimbus-D solar-conversion power supply subsystem Quarterly technical report, 15 Dec. 1968 - 15 Mar. 1969
 [NASA-CR-103418] p0055 N69-32305
 Nimbus-D solar conversion power supply subsystem Quarterly technical report, 15 Mar. - 15 Jun. 1969
 [NASA-CR-106009] p0055 N69-38842
 Study to determine and improve design for lithium-doped solar cells Quarterly report, 1 Oct. - 31 Dec. 1970
 [NASA-CR-116220] p0060 N71-16472

RAND CORP., SANTA MONICA, CALIF.
 Signed digraphs and the growing demand for energy
 [R-756-NSF] p0018 N72-20948
 The effect of fuel price increases on energy intensiveness of freight transport
 [R-804-NSF] p0258 N72-23979
 Growth rates within the transportation sector
 [P-4935] p0021 N73-23962
 Transportation and energy
 [P-5025] p0113 N73-33921

RASOR (WED S.), DAYTON, OHIO.
 Practical aspects of fundamental research in thermionic conversion Final technical report, 1 Mar. - 1 Sep. 1969
 [AD-699944] p0232 N70-26434

RESEARCH INST. OF NATIONAL DEFENCE, STOCKHOLM (SWEDEN).
 Electrical power production by means of MHD, present situation and future prospects
 [FOA-4-C-4325-55] p0223 N69-35224

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH (ENGLAND).
 Recent developments in silicon solar cells
 p0050 N68-28741
 The ion engine and large solar array for the X-5 spacecraft
 [RAE-TR-68191] p0054 N69-24137
 Large solar array development in UK
 [RAE-TR-69007] p0060 N71-11063
 Status report on RAE advanced solar array development
 [RAE-TR-72109] p0067 N73-21959

ROYAL INST. OF TECH., STOCKHOLM (SWEDEN).
The future energy supply of the world
[REPT-69-11] p0013 N69-35574

ROYAL SWEDISH ACADEMY OF ENGINEERING SCIENCES,
STOCKHOLM.
Natural gas - Energy source and raw material
[IVA-MEDD-167] p0096 N71-30522
Swedish research on energy and its global
relationship p0018 N72-13956

RUGBY COLL. OF ENGINEERING TECHNOLOGY (ENGLAND).
A collection of notes on diesel engine economics
[REPT.-1] p0081 N68-24990

RWE-AKTIEGESELLSCHAFT, ESSEN (WEST GERMANY).
Resources of primary energy
[A/CONF-49/P/359] p0098 N72-16981

S

SANDIA CORP., ALBUQUERQUE, N.MEX.
The aerial detection of Co-60 fueled
radioisotope thermoelectric generators
[SC-TM-68-627] p0013 N69-19492
Selected thermoelectric, thermionic, and
electron-voltaic energy conversion device
characteristics [SC-ARPC-1011] p0224 N69-38033
SNAP-19 residual fire test [SC-DR-69-490] p0230 N70-19359
Transit analysis [SC-ER-69-662] p0091 N70-21251

SANDIA LABS., ALBUQUERQUE, N.MEX.
Advancements in pellet-type thermal battery
technology [SC-ER-69-497-A] p0267 N73-21084
Analysis of linear focused collectors for solar
power [SLA-73-5319] p0068 N73-33007

SCIENTIFIC TRANSLATION SERVICE, SANTA BARBARA,
CALIF.
Development of installations for direct
conversion of heat into electrical energy by
means of MHD-generators and other new energy
devices p0236 N70-37070

Sole balloon solar generators [NASA-TT-F-13836] p0063 N72-14032
Selective surfaces and coatings in solar
radiation engineering [NASA-TT-F-14650] p0066 N73-15598
Applied magnetohydrodynamics, report no. 10,
MHD-test facility Argas 2: Description and
operations [NASA-TT-F-14876] p0252 N73-22662
Utilization of wind power by means of elevated
wind power plants [NASA-TT-F-14903] p0107 N73-23011
The first aerodynamic three-phase electric power
plant in Balaklava [NASA-TT-F-14933] p0107 N73-24268
Lunatic architecture [NASA-TT-F-14963] p0068 N73-26976
Experimental aerogenerator type BEST - Romani,
description, assembly, test program [NASA-TT-F-15037] p0110 N73-29004
The development of wind power installations for
electrical power generation in Germany [NASA-TT-F-15050] p0111 N73-29009

SCRIPTA TECHNICA, INC., WASHINGTON, D.C.
Brief description of the pilot plant
installation and the incore-thermionic reactor
[NASA-TT-F-13744] p0243 N71-35787

SELENIA S.p.A., ROME (ITALY).
Solar generator for ELDO P/9
[REPT-RT-68/719] p0057 N70-17439

SHELL DEVELOPMENT CO., EMERYVILLE, CALIF.
Hydrocarbon fuels for advanced systems
[AD-737372] p0100 N72-23806

SHELL RESEARCH, LTD., CHESTER (ENGLAND).
Investigation of the peculiarities of pre-flame
processes and ignition of hydrocarbons of
various structures. Part 1 - Variation of
cool flame delay and ignition delay with
compression temperature and pressure p0080 N68-19175

SIEMENS-SCHUCKERTWERKE A.G., ERLANGEN (WEST GERMANY).
Development of a thermoelectric converter for a
nuclear energy system [BMW-FB-W-68-10] p0202 N68-24189

SOCIETA RICEERCHE IMPIANTI NUCLEARI, SALUGGIA (ITALY).
Present status of investigations on the heat
transfer problems of the earth burial of space
radioisotope heat sources [SORIN-T/601] p0091 N70-21969

SOCIETE HISPANO-SUIZA, BOIS-COLOMBES (FRANCE).
Thermodynamic aspects in two phases for space
applications p0196 N68-17799

STANFORD RESEARCH INST., MENLO PARK, CALIF.
Some major impacts of the national space
program. 4 - Impacts of new materials
technology [NASA-CR-96813] p0011 N68-34388

STANFORD UNIV., CALIF.
Distribution of hydrocarbon fluids and their
compositions in volatile oil reservoirs during
depletion p0080 N68-21048

Performance characteristics of a
combustion-driven magnetogasdynamic power
generator p0202 N68-23346

Boundary phenomena in MHD generators Summary
report, 15 Feb. 1966 - 15 Feb. 1968
[AFOSR-68-0859] p0202 N68-26537

Experimental electrode current distributions in
MHD channels [SU-IPR-230] p0205 N68-31787

Electrode temperature effect on MHD generator
performance [AD-683793] p0220 N69-27071

Effects of electrode size on the performance of
a combustion driven MHD generator Technical
report Jul. 1966 - Jul. 1969 [AD-694039] p0228 N70-14933

Structural and lithologic study of northern
coast ranges and Sacramento Valley, California
[E73-10478] p0107 N73-21315

Relation of ERTS-1 detected geologic structure
to known economic ore deposits [PAPER-G18] p0109 N73-28249

STATE OF OHIO DEPT. OF DEVELOPMENT, COLUMBUS.
Relevance of ERTS-1 to the State of Ohio
[E73-10032] p0104 N73-15365

Relevance of ERTS to the State of Ohio
[E73-10987] p0112 N73-31294

STEINKOHLER-ELEKTROIZITÄT A.G., ESSEN (WEST GERMANY).
Water-suspended coal supply to thermal power
plants p0092 N70-29067

STICHTING VOOR FUNDAMENTEEL ONDERZOEK DER MATERIE,
JUTPHAAS (NETHERLANDS).
Plasma production and heating by laser radiation
[NP-17453] p0204 N68-30330

SUNDSTRAND AVIATION-ROCKFORD, ILL.
Organic Rankine cycle technology program
Quarterly progress report, 1 Jul. 1969 - 1
Jan. 1970 [SAN-651-118] p0237 N70-37652

SYSTEMS RESEARCH CORP., WASHINGTON, D.C.
Naval surface ship Arctic missions. Volume 2,
appendix A - Arctic resources [AD-716415] p0094 N71-19770

SYSTEMS RESEARCH LABS., INC., DAYTON, OHIO.
Construction and test of an MHD generator
channel and electrical power converter [AD-758783] p0253 N73-25106

T

TECHNICAL UNIV., COPENHAGEN (DENMARK).
Plasma research in Denmark p0216 N69-18448

TECHNISCHE HOCHSCHULE, STUTTGART, (WEST GERMANY).
Results of studies on thermionic reactor systems
[REPT.-68-007] p0201 N68-21856

TECHNISCHE HOOGESCHOOL, EINDHOVEN (NETHERLANDS).
On the mechanism of the generation of petroleum
p0078 N68-10414

MHD power conversion employing liquid metals
[TH-69-E-06] p0222 N69-31249

Conducting grids to stabilized MHD generator
plasmas against ionization instabilities
[TH-72-E-31] p0253 N73-23757

TECHNISCHE UNIV., BERLIN (WEST GERMANY).
Comparative performance analysis of linear MHD
generators [TUBIK-15] p0234 N70-32771

- TECHTRAN CORP., GLEN BURNIE, MD.**
 Reforming of gaseous hydrocarbons into town gas
 [NASA-TT-F-13668] p0095 N71-28159
 The Bole program
 [NASA-TT-F-14279] p0100 N72-25345
 Calculation and comparison of the economics of
 electrochemical fuel cells
 [NASA-TT-F-15147] p0254 N73-31991
- TENNESSEE UNIV., KNOXVILLE.**
 Regional landscape change: A case for ERTS-1
 [E72-10265] p0103 N73-12364
 Geographic applications of ERTS-A imagery to
 rural landscape change
 [E72-10355] p0103 N73-14343
 Geographic analysis of landscape change from
 ERTS-1 imagery
 [E73-10661] p0108 N73-25357
 Geographic analysis of landscape change from
 ERTS-1 imagery
 [E73-10694] p0108 N73-25386
 Applications of ERTS-1 data to landscape change
 in eastern Tennessee
 [E73-10843] p0110 N73-28421
- TENNESSEE UNIV., TULLAHOMA.**
 Current distribution of a segmented Hall generator
 [AD-705160] p0234 N70-32778
 The performance of a family of diagonal
 conducting wall MHD open cycle generators
 [AD-705159] p0235 N70-32986
 Fluctuations in series connected open cycle MHD
 generators
 [AD-721454] p0242 N71-28680
 Factors effecting the performance of diagonal
 conducting wall open cycle MHD generators
 [AD-721455] p0242 N71-28718
 Contributions from space technology to central
 power generation
 p0250 N73-13865
- TENNESSEE VALLEY AUTHORITY, MUSCLE SHOALS, ALA.**
 Production of ammonia using low-cost nuclear
 energy
 p0117 N70-14512
- TEXAS INSTRUMENTS, INC., DALLAS.**
 Development and fabrication of lithium- diffused
 silicon solar cells Final report, 18 Aug. -
 31 Jan. 1968
 [NASA-CR-97077] p0051 N68-35814
 Evaluation of commercial utility of ERTS-A
 imagery in structural reconnaissance for
 minerals and petroleum
 [E73-10094] p0104 N73-15340
 ERTS-1 imagery use in reconnaissance
 prospecting: Evaluation of commercial utility
 of ERTS-1 imagery in structural reconnaissance
 for minerals and petroleum
 [E73-10414] p0105 N73-20376
 Evaluation of commercial utility of ERTS-A
 imagery in structural reconnaissance for
 minerals and petroleum
 [E73-10523] p0107 N73-23414
 Evaluation of commercial utility of ERTS-A
 imagery in structural reconnaissance for
 minerals and petroleum
 [E73-10700] p0108 N73-25392
 Evaluation of commercial utility of ERTS-A
 imagery in structural reconnaissance for
 minerals and petroleum
 [PAPER-630] p0109 N73-28261
- TEXTRON ELECTRONICS, INC., SYLMAR, CALIF.**
 Development of an integrated lightweight
 flexible silicon solar cell array Quarterly
 technical report, 1 Jul. - 1 Oct. 1969
 [NASA-CR-106379] p0056 N69-40952
- THERMO ELECTRON CORP., WALTHAM, MASS.**
 Hydrogen-oxygen fired thermionic generators and
 thermionic diodes
 [NASA-CR-101745] p0222 N69-30871
- THERMO ELECTRON ENGINEERING CORP., WALTHAM, MASS.**
 Six-converter solar thermionic generator /JG-4/
 Quarterly progress report, 1 Jul. - 15 Dec. 1967
 [NASA-CR-92586] p0046 N68-15766
 Solar thermionic generator development Quarterly
 report, 1 Sep. - 30 Nov. 1967
 [NASA-CR-92520] p0047 N68-16074
 Solar thermionic generator development Quarterly
 report, 1 Dec. 1967 - 29 Feb. 1968
 [NASA-CR-94402] p0048 N68-22991
- Six-converter solar thermionic generator Final
 report, 10 Jan. 1967 - 31 Mar. 1968
 [NASA-CR-98712] p0052 N69-14920
- THOMPSON RAMO WOOLDRIDGE, INC., CLEVELAND, OHIO.**
 Radiator design limitations for dynamic converters
 p0195 N68-17796
- TORONTO UNIV. (ONTARIO).**
 Operation of an MGD power generator Concluding
 report, 1 Jun. - 30 Nov. 1967
 [NASA-CR-72477] p0208 N69-12307
 Design and construction of a 3-MW
 magnetogasdynamic power generation facility at
 the University of Toronto Institute of
 Aerospace Studies
 p0216 N69-18447
- The development of an airborne remote laser
 fluorosensor for use in oil pollution
 detection and hydrologic studies
 [UTIAS-175] p0099 N72-20479
- TRANSLATION CONSULTANTS, LTD., ARLINGTON, VA.**
 Energy storage capabilities of superconductors
 in view of high power discharge
 [NASA-TT-F-13585] p0266 N71-23515
 The possibility of using microwave ionization to
 obtain nonequilibrium plasma in MHD generators
 [NASA-TT-F-13783] p0242 N71-32212
- TRW EQUIPMENT LABS., CLEVELAND, OHIO.**
 Brayton cycle cavity receiver design study
 [NASA-CR-54752] p0237 N70-42202
- TRW SPACE TECHNOLOGY LABS., SAN BERNARDINO, CALIF.**
 Nuclear source limitations for direct conversion
 devices
 p0196 N68-17803
- TRW SYSTEMS GROUP, REDONDO BEACH, CALIF.**
 Mariner Mars power system optimization study
 Interim report, 4 Mar. - 31 May 1968
 [NASA-CR-95263] p0050 N68-27974
 Modular Energy Storage And Conditioning /NESAC/
 study Interim report
 p0264 N69-12431
- Study and analysis of satellite power systems
 configurations for maximum utilization of
 power, phase 2 Technical report, 12 Sep. 1966
 - 31 Dec. 1968
 [NASA-CR-100038] p0053 N69-18748
 Modular Energy Storage And Conditioning /NESAC/
 study Final report
 [NASA-CR-116510] p0266 N71-17471
- Study to establish criteria for a solar cell
 array for use as a primary power source for a
 lunar-based water electrolysis system, phase 4
 [NASA-CR-119945] p0062 N71-36441
- The 20 kW battery study program
 [NASA-CR-122296] p0266 N72-11982
- TRW SYSTEMS, REDONDO BEACH, CALIF.**
 Study to establish criteria for a solar cell
 array for use as a primary power source for a
 lunar-based water electrolysis system, phase 1
 Final technical report, 1 Jul. 1967 - 30 Jun.
 1968
 [NASA-CR-61979] p0051 N68-36000
 Batteries for space power systems
 [NASA-SP-172] p0265 N69-18042

U

- UNION CARBIDE CORP., PARMA, OHIO.**
 Hydrazine-air fuel cell controls
 [AD-684339] p0221 N69-28781
- UNITED KINGDOM ATOMIC ENERGY AUTHORITY, CULHAM
 (ENGLAND).**
 Economic generation of power from thermonuclear
 fusion
 [CLM-R-85] p0202 N68-25016
- UNITED KINGDOM ATOMIC ENERGY AUTHORITY, RISLEY
 (ENGLAND).**
 EQUICORE - A space dependent code to assess the
 nuclear and thermal performance of SGHW and
 similar reactors
 [TRG-1808] p0230 N70-22307
 High-temperature reactor
 [TRG-1996] p0093 N70-37284
- UNITED NATIONS, NEW YORK.**
 World energy requirements and resources in the
 year 2000
 [A/CONF-49/P/420] p0018 N72-16982

CORPORATE SOURCE INDEX

WORLD METEOROLOGICAL ORGANIZATION,

The exploration of non-agricultural natural resources in developing countries by the United Nations p0099 N72-23295

UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, VILLA OBREGON. p0093 N70-37298

Enrichment of uranium by thermal diffusion [NP-18173]

UTAH UNIV., SALT LAKE CITY. Investigation of synchronous-wave RF to dc conversion Final report, 1 Jan. 1966 - 31 Dec. 1967 [REPT.-4] p0205 N68-30681

V

VON KARMAN INST. FOR FLUID DYNAMICS, RHODE-SAINT-GENESE (BELGIUM). Some remarks on EFD energy conversion p0216 N69-18446

Aerodynamic problems in cooled turbine blading design for small gas turbine p0220 N69-26532

W

WAYNE STATE UNIV., DETROIT, MICH. Applying NASA technology to air pollution - The sulfur dioxide problem, section 2 Final report [NASA-CR-100629] p0013 N69-39189

WEST VIRGINIA UNIV., MORGANTOWN. Characteristics of a finite length M.H.D. traveling wave cylindrical accelerator or generator p0204 N68-30018

Influence of ultrasonic energy upon the rate of flow of liquids through porous media p0092 N70-25326

WESTERN RESERVE UNIV., CLEVELAND, OHIO. Kinetic factors in fuel cell systems - The oxygen electrode p0199 N68-17824

WESTINGHOUSE ELECTRIC CORP., LINN, OHIO. Electrical component technology for 0.25 to 10.0 megawatt space power systems, design study Quarterly technical progress report, Mar. 1, 1966 - May 31, 1967 [SAN-679-3] p0191 N68-10967

Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems. Parametric design study of canned ac induction motors [SAN-679-5] p0205 N68-31544

Design study of electrical component technology for 0.25 to 10.0 megawatt space power systems. Power conditioning - Parametric screening study [WAED-67-45E] p0206 N68-32748

Electrical component technology for 1/4 to 10 megawatt space power [CONF-680802-1] p0206 N68-34481

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA. Study of fabrication techniques for SiC solar cells Final technical report [NASA-CR-73444] p0059 N70-37465

Cascaded thermoelectric test generator Final report [NASA-CR-110877] p0238 N70-42733

Thermoelectric heating and ventilating system [AD-737720] p0247 N72-24139

Thermally cascaded thermoelectric generator [NASA-CASP-NPO-10753] p0247 N72-26031

WHITELEY INDUSTRIES, INC., WILMINGTON, MASS. Power generating subcomponent/fuel cell module [AD-744477] p0249 N72-32078

WOLF RESEARCH AND DEVELOPMENT CORP., POCOMOKE CITY, MD. Applicability of satellite remote sensing for monitoring surface mining activities [E73-10731] p0108 N73-26337

Applicability of satellite remote sensing for monitoring surface mining activities [E73-11033] p0112 N73-31337

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. Eastern Atlantic Continental Margin program of the international decade of ocean exploration (GX-28193), some results of 1972 cruise of R/V Atlantis 2 [PB-211393] p0103 N73-14400

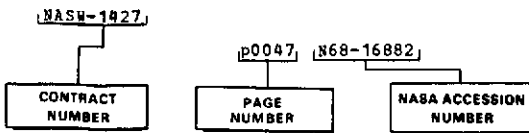
WORLD METEOROLOGICAL ORGANIZATION, GENEVA (SWITZERLAND). Environmental factors in operations to combat oil spills [WHO-359] p0112 N73-32300

CONTRACT NUMBER INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Contract Number Index Listing



Listings in this index are arranged alphabetically by contract number. Under each contract number, the accession numbers denoting documents that have been produced as a result of research done under that contract are arranged in ascending order with the IAA accession numbers appearing first. The accession number denotes the number by which the citation is identified in either the IAA or STAR section. Preceding the accession number is the page number in the abstract section in which the citation may be found.

AF PROJ. G101
p0251 N73-16036
AF PROJ. 3048
p0100 N72-23806
AF PROJ. 3145
p0247 N72-21497
p0252 N73-22702
p0068 N73-30982
p0254 N73-31996
p0245 N72-11065
p0249 N73-10247
p0250 N73-11717
p0267 N73-23014
p0253 N73-23765
p0253 N73-25106
p0267 N73-26054
p0254 N73-30890
AF 19/628/-3836
p0200 N68-21051
AF 33/615/-67-C-1127
p0129 A68-27110
p0169 A70-40005
AF 33/615/-67-C-1148
p0144 A69-23471
AF 33/615/-67-C-1375
p0167 A70-39988
p0169 A70-40015
AF 33/615/-67-C-1928
p0150 A69-27502
AF 33/615/-69-C-1171
p0169 A70-40013
p0169 A70-40005
AF 33/615/-2691
p0119 A68-12258
p0127 A68-23920
p0132 A68-39717
AF 33/615/-3309
p0080 N68-21041
AF 33/615/-3413
p0144 A69-23473
p0228 N70-15650
AF 33/615/-3489
p0129 A68-26140
AF 33/657/-16410
p0079 N68-12884
AF 40/600/-1200
p0126 A68-23914
p0127 A68-23919
AF 44/620/-68-C-0048
p0168 A70-39991
AF 44/620/-69-C-0031
p0169 A70-40004
AF 44/620/-70-C-0075
p0074 A71-38076
p0175 A71-38099
AF 49/638/-1553
p0206 N68-31928
AF 49/638/-1695
p0132 A68-37310
p0202 N68-26537
p0205 N68-31787
AF 49/638/-01721
p0192 N68-11928
AF 61/952/-548
p0197 N68-17813

AF-AFOSR-287-66
p0130 A68-29309
AF-AFOSR-1308-67
p0238 N71-12372
AF-9800
p0250 N73-12068
AID/CSD-2584
p0064 N72-31092
ARPA ORDER 1622
p0104 N73-15454
ARPA ORDER 2357
p0254 N73-30890
AT (04-3)-167
p0186 A73-26026
AT (04-3)-701
p0184 A73-22799
p0186 A73-26024
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p0189 A73-38419
p0076 A73-38427
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p0077 A73-38430
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p0077 A73-40766
AT (30-1)-1238
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AT (45-1)-2166
p0188 A73-36681
AT (45-1)-2225
p0183 A73-17667
AT/04-3/-167
p0081 N68-29161
p0083 N69-17117
p0088 N70-15236
p0094 N71-15083
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p0088 N70-12921
AT/04-3/-651
p0237 N70-37652
AT/04-3/-679
p0191 N68-10967
p0205 N68-31544
p0206 N68-32748
p0206 N68-34481
AT/04-3/-700
p0234 N70-31239
p0234 N70-31812
AT/07-2/-1
p0086 N69-31541
AT/10-1/-1230
p0088 N70-13396
AT/29-1/-789
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AT/29-2/-2510
p0161 A69-42260
AT/29-2/-2564
p0163 A70-14897
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p0176 A71-38927

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p0122 A68-19482
p0218 N69-23954
AT/30-1/-3607
p0207 N68-37951
AT/30-1/-3622
p0190 N68-10758
AT/30-1/-3691
p0191 N68-11382
p0239 N71-15039
AT/33-1/-GEN-53
p0082 N69-15081
AT/33-2/-1
p0010 N68-25106
AT/38-1/-430
p0078 N68-11281
AT/45-1/-1830
p0082 N69-15237
p0082 N69-15543
p0224 N69-38506
p0094 N71-21050
BCL-72-17/G-1793
p0102 N73-12358
p0104 N73-15365
CG PROJ. 714104
p0098 N72-14478
CHEN-ELDO/CTR/17/G/17
p0091 N70-21969
CPA-22-69-147
p0017 N71-31900
DA PROJ. 1G6-63702-DG-10
p0246 N72-14040
p0118 N72-18520
DA PROJ. 1J0-62110-AJ-33
p0247 N72-24139
DA PROJ. 1S6-63719-DK-75
p0063 N72-19066
DA PROJ. 1T0-61102-B-11A
p0252 N73-22168
DA-ARO/D/-31-124-70-685
p0074 A71-38076
p0175 A71-38099
DA-01-021-AMC-12820/Z/
p0139 A68-43072
p0207 N68-37342
DA-28-043-AMC-02290/E/
p0205 N68-30681
DA-44-009-AMC-983/Z/
p0191 N68-11503
DA-44-009-AMC-1607/T/
p0193 N68-15230
DAAB07-67-C-0376
p0200 N68-20884
DAAB07-70-C-0136
p0249 N72-32078
DAAB07-70-C-0153
p0118 N72-18520
DAAG17-70-C-0094
p0247 N72-24139
DAAH01-67-C-1036/Z/
p0195 N68-17223
DAAH01-72-C-0982
p0106 N73-20819
DAAK02-67-C-0063
p0249 N72-33068
DAAK02-70-C-0158
p0246 N72-14040
DAAK02-70-C-0517
p0254 N73-30979
DAHC15-67-C-0011
p0264 N69-11907
p0219 N69-25803
DAST-19W70-02038
p0014 N70-21569
DI-14-01-001-500
p0192 N68-12477
DI-14-31-0001-3729
p0109 N73-27359
DI-14-32-0001-1213
p0250 N73-13865
DOT-CG-10255-A
p0017 N71-32625
DOT-CG-93228-A
p0098 N72-14402

EHS-70-104
p0266 N72-11410
EPA-AP-385
p0075 A73-15867
ESTEC-623/68SL
p0058 N70-30140
EURATOM-025-62-10- RISP
p0078 N68-10864
EURATOM-092-66-6 TEBI
p0081 N68-23663
EURATOM-246-66-1 ORGP
p0086 N69-34967
FA-68-WF-273
p0093 N70-34002
FTD PROJ. 6040102
p0245 N72-10782
F03-AP-41-1105-02
p0098 N72-16934
F19628-68-C-0365
p0097 N72-10830
F33615-67-C-1019
p0245 N72-11065
F33615-67-C-1127
p0220 N69-27071
p0228 N70-14933
F33615-68-C-1182
p0062 N71-31939
F33615-69-C-1226
p0248 N72-29734
F33615-69-C-1450
p0241 N71-26190
F33615-70-C-1038
p0100 N72-23806
F33615-70-C-1567
p0249 N73-10247
p0250 N73-11717
F33615-71-C-1425
p0253 N73-25106
F33615-71-C-1454
p0267 N73-23014
p0267 N73-26054
F33615-71-C-1456
p0253 N73-23765
F33615-72-C-1310
p0041 A73-14213
F33615-72-C-1394
p0254 N73-30890
F44620-69-C-0031
p0234 N70-32778
p0235 N70-32986
p0242 N71-28680
p0242 N71-28718
p0250 N73-13865
F44620-70-C-0001
p0179 A72-29355
F44620-72-C-0053
p0104 N73-15454
GFW-EV-1-1-TO-3/71-B
p0041 A73-14222
H-779
p0011 N68-31690
p0011 N68-31703
IAEA-375/RB
p0089 N70-15280
JPL-951263
p0047 N68-16074
p0048 N68-22991
JPL-951770
p0046 N68-15766
p0052 N69-14920
JPL-951934
p0051 N68-31404
JPL-951969
p0052 N68-36630
JPL-951970
p0025 A68-42560
p0048 N68-21879
p0051 N68-32561
JPL-952035
p0046 N68-14185
JPL-952151
p0050 N68-27974
JPL-952196
p0238 N70-42733
JPL-952314
p0061 N71-23714

CONTRACT NUMBER INDEX

JPL-952453	NAS3-10936	NAS5-23133	NGL-34-001-001
p0169 A70-40015	p0236 N70-36860	p0112 N73-33264	p0248 N72-27230
p0233 N70-29169	NAS3-10938	p0112 N73-33269	NGL-39-010-001
JPL-952555	p0081 N68-25283	NAS7-100	p0040 A73-14209
p0060 N71-16472	p0223 N69-34989	p0188 A73-38311	p0223 N69-34810
JPL-952560	NAS3-11159	p0046 N68-14185	p0062 N71-34042
p0056 N69-40952	p0104 N73-17916	p0046 N68-15766	NGR-11-002-145
p0057 N70-25500	NAS3-11512	p0047 N68-16074	p0184 A73-22829
p0059 N70-43081	p0058 N70-28421	p0201 N68-21597	p0189 A73-38411
JPL-952571	NAS3-11821	p0048 N68-21879	p0189 A73-38412
p0061 N71-20727	p0051 N68-33207	p0048 N68-22991	NGR-39-010-002
JPL-952985	NAS3-11826	p0050 N68-27974	p0219 N69-25396
p0249 N72-30655	p0231 N70-25623	p0051 N68-31404	NGR-39-087-002
JPL-953042	NAS3-11838	p0051 N68-32561	p0033 A70-80623
p0066 N73-19059	p0063 N72-14029	p0052 N68-36630	p0056 N70-12119
JPL-953270	NAS3-15345	p0209 N69-13045	NGR-48-002-044
p0068 N73-30977	p0067 N73-20044	p0209 N69-13151	p0183 A73-17667
JPL-953387	NAS5-9149	p0209 N69-13240	NGR-52-026-012
p0066 N73-15079	p0133 A68-41217	p0209 N69-13286	p0208 N69-12307
NAONR-7-71	p0140 A69-11801	p0209 N69-13287	NONR-580 (18)
p0250 N73-12064	NAS5-9167	p0209 N69-13288	p0250 N73-12800
NASA ORDER S-70243-AG-1	p0049 N68-23987	p0214 N69-13391	NONR-580/18/
p0105 N73-18353	NAS5-9178	p0214 N69-13818	p0225 N69-39863
p0112 N73-31339	p0053 N69-18748	p0052 N69-14920	NONR-580/19/
NASW-1427	p0266 N71-17471	p0217 N69-21376	p0233 N73-29012
p0047 N68-16882	NAS5-9210	p0056 N69-40952	NONR-1841/51/
NASW-1435	p0023 A68-17380	p0057 N70-25500	p0056 N70-11427
p0085 N69-30800	NAS5-10225	p0233 N70-29169	NONR-2300/08/
NASW-1449	p0023 A68-17380	p0238 N70-42733	p0217 N69-20548
p0190 N68-10050	NAS5-10274	p0059 N70-43081	NONR-3192/00/
NASW-1692	p0051 N68-35814	p0060 N71-13427	p0232 N70-26947
p0214 N69-14070	NAS5-10470	p0060 N71-16472	NONR-3867/00/
NASW-1722	p0055 N69-32305	p0061 N71-20727	p0226 N70-11420
p0011 N68-34388	p0055 N69-38442	p0061 N71-23714	p0234 N70-31999
NASW-2035	NAS5-11547	p0064 N72-26034	p0237 N70-40031
p0063 N72-14032	p0265 N69-24894	p0101 N72-26528	p0238 N71-10992
NASW-2036	NAS5-11549	p0249 N72-30655	p0241 N71-24680
p0243 N71-35787	p0053 N69-22175	p0065 N72-32070	NON-62-0604-C
NASW-2037	NAS5-11557	p0065 N72-33061	p0079 N68-15844
p0095 N71-28159	p0053 N69-16975	p0066 N73-15079	p0265 N70-22537
p0100 N72-25345	NAS5-11585	p0066 N73-19059	p0059 N70-38210
NASW-2038	p0266 N71-13514	NAS7-428	NON-66-0738-A
p0266 N71-23515	NAS5-11637	p0055 N69-38646	p0178 A72-25629
p0242 N71-32212	p0033 A70-34131	NAS7-547	NR PROJ. 099-382
NASW-2173	NAS5-11644	p0202 N68-24455	p0250 N73-12800
p0253 N73-26045	p0163 A70-14896	p0054 N69-29374	NSF GI-44
NASW-2481	NAS5-21066	NAS7-658	p0018 N72-20948
p0106 N73-21253	p0266 N72-11982	p0233 N70-29729	p0113 N73-33921
p0111 N73-29008	NAS5-21726	NAS7-728	NSF GI-27976
p0111 N73-30976	p0103 N73-12364	p0266 N72-17020	p0065 N73-10976
p0268 N73-31676	p0103 N73-14343	NAS8-2696	NSF GI-32726
NASW-2482	p0108 N73-25357	p0191 N68-11030	p0042 A73-16816
p0106 N73-21238	p0108 N73-25386	NAS8-21189	NSF GK-1165
NASW-2483	p0110 N73-28421	p0051 N68-36000	p0209 N69-13069
p0066 N73-15598	NAS5-21735	p0062 N71-36441	NSF GK-28562
p0252 N73-22662	p0103 N73-14315	NAS8-25986	p0183 A73-17667
p0107 N73-24268	p0105 N73-18354	p0066 N73-17911	NSF GP-579
p0068 N73-26976	p0106 N73-20404	NAS9-4282	p0122 A69-19482
p0110 N73-29004	p0108 N73-25342	p0222 N69-30871	NSF GS-31253
p0111 N73-29009	p0112 N73-32229	NAS9-5266	p0258 N72-23979
NASW-2485	NAS5-21762	p0023 A68-16784	p0103 N73-14400
p0254 N73-31991	p0101 N72-31353	NAS9-8381	NSF G1-30022
NAS1-9495	p0102 N73-12356	p0089 N70-16407	p0042 A73-15802
p0063 N72-13046	p0103 N73-13334	NAS9-10273	NSF K-016286
NAS1-10900	p0019 N73-15339	p0174 A71-36404	p0074 A71-38076
p0102 N73-11019	p0106 N73-20391	NAS9-11033	p0175 A71-38099
NAS2-3894	p0106 N73-20413	p0247 N72-23053	NSF ORDER AAA-R-4-79
p0011 N68-28227	p0107 N73-25338	NAS9-11034	p0017 N72-11848
NAS2-4682	NAS5-21764	p0249 N72-30029	NSG-101-61
p0214 N69-14760	p0101 N72-29272	NAS9-11039	p0079 N68-17316
NAS2-5519	NAS5-21775	p0060 N71-16462	NSG-316
p0034 A71-16071	p0107 N73-21315	p0065 N72-33057	p0263 N68-17798
NAS2-5595	NAS5-21782	p0068 N73-30057	p0010 N68-21035
p0059 N70-37465	p0102 N73-12358	NAS9-11343	p0207 N69-10111
NAS3-2779	p0104 N73-15365	p0074 A71-38948	NSG-325
p0237 N70-42202	p0112 N73-31294	NAS9-13310	p0166 A70-30100
NAS3-2793	NAS5-21795	p0108 N73-26337	NSR-09-012-903
p0057 N70-20627	p0102 N72-32336	p0112 N73-31337	p0064 N72-27055
NAS3-8511	p0102 N73-10372	NAS9-13358	NSR-09-012-909
p0222 N69-32553	p0105 N73-18321	p0109 N73-27277	p0084 N69-28160
NAS3-8997	p0105 N73-19366	NGI-05-003-003	NSR-09-012-915
p0044 A73-26001	p0108 N73-27252	p0073 A70-12516	p0087 N70-12263
NAS3-9426	p0111 N73-30311	p0076 A73-25465	NSR-23-006-044
p0173 A71-32223	p0112 N73-31338	p0076 A73-25471	p0013 N69-39189
NAS3-9434	NAS5-21796	NGI-10-005-088	NSR-31-001-078
p0054 N69-23369	p0104 N73-15340	p0229 N70-17651	p0055 N69-38783
NAS3-10600	p0105 N73-20376	NGI-22-009-309	NSR-32-004-049
p0026 A69-15675	p0107 N73-23414	p0103 N73-13991	p0089 N70-15491
p0046 N68-12252	p0108 N73-25392	p0103 N73-13992	NSR-39-003-008
NAS3-10777	NAS5-21876	p0258 N73-30464	p0074 A71-38076
p0208 N69-10335	p0107 N73-22284		

CONTRACT NUMBER INDEX

p0175 A71-38099
 N00014-66-C-0147
 p0133 A68-41217
 p0140 A69-11801
 N00014-68-A-0173-C009
 p0250 N73-12800
 N00014-69-C-0279
 p0232 N70-26434
 N00014-70-C-0075
 p0074 A71-38076
 p0175 A71-38099
 N00014-70-C-0321
 p0241 N71-24680
 p0246 N72-13211
 p0250 N73-12068
 N00014-70-C-3323
 p0094 N71-19770
 N00019-67-C-0546
 p0162 A69-42294
 N00019-68-60402
 p0262 A71-13041
 N00025-71-C-0026
 p0267 N73-13997
 N00228-68-C-0554
 p0225 N69-40031
 PROJ. 9800
 p0246 N72-13211
 SP35431005
 p0255 N73-33009
 USCG PROJ. 714104/A/002
 p0098 N72-14402
 W-31-109-ENG-38
 p0012 N69-15807
 p0090 N70-19586
 p0096 N71-36736
 p0267 N73-19061
 p0268 N73-30058
 W-7405-ENG-26
 p0078 N68-12420
 p0078 N68-12553
 p0204 N68-30162
 p0083 N69-17558
 p0083 N69-19229
 p0083 N69-19605
 p0232 N70-25646
 p0233 N70-29364
 p0015 N70-37097
 p0096 N71-35815
 p0017 N72-11848
 p0098 N72-17737
 p0100 N72-24703
 p0018 N72-25635
 W-7405-ENG-36
 p0010 N68-28181
 p0264 N69-14302
 p0097 N72-12617
 p0076 A73-38427
 W-7405-ENG-48
 p0205 N68-30760
 p0205 N68-31910
 p0207 N68-35919
 p0218 N69-22640
 p0020 N73-16766
 p0079 N68-17316
 120-27 p0226 N70-11975
 p0233 N70-28433
 p0238 N71-11689
 p0240 N71-17933
 p0240 N71-18866
 120-27-05-01-22
 p0193 N68-14630
 120-27-06-05-22
 p0080 N68-19925
 120-27-06-06-22
 p0192 N68-14585
 p0050 N68-30751
 120-33-01-10-22
 p0047 N68-16695
 120-33-05-02-22
 p0047 N68-18998
 120-33-06-03-23
 p0048 N68-22258
 p0053 N69-21088
 120-33-06-08-23
 p0052 N69-10708
 120-33-06-11-23
 p0054 N69-28123
 120-33-07-03-22
 p0052 N69-10227
 120-33-17-08
 p0058 N70-29807

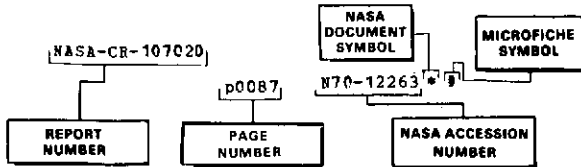
124-09-18-04-22
 p0055 N69-31895
 126-15 p0096 N71-31456
 126-15-01-31-22
 p0013 N69-35723
 128-27-05-20-22
 p0200 N68-19146
 129-02 p0224 N69-37883
 129-02-01-07-22
 p0207 N68-37259
 129-02-08-05-22
 p0217 N69-20852
 p0217 N69-20875
 p0224 N69-35732
 160-75-73-04-10
 p0097 N72-12329
 704-13 p0061 N71-20471
 720-03 p0117 N70-42326
 p0094 N71-20533
 789-50-01-01-22
 p0081 N68-23895
 112-02 p0247 N72-24755
 112-27 p0243 N71-35233
 p0248 N72-28685
 113-33 p0063 N72-19057
 113-34-22-00
 p0244 N71-36452
 129-09 p0244 N71-36450
 130-06-17-11-15
 p0118 N72-18911
 501-24 p0104 N73-16771
 p0105 N73-18960
 p0258 N73-18981

REPORT/ACCESSION NUMBER INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Report/Accession Number Index Listing



Listings in this index are arranged alphanumerically by report number. The number indicates the abstract page on which the citation is located. The accession number denotes the number by which the citation is identified. An asterisk (*) indicates that the item is a NASA report. A pound sign (#) indicates that the item is available on microfiche. A plus sign (+) indicates a document that cannot be microfiched but for which one-to-one facsimile is available.

A-3905 p0118 N72-18911*#
 A/CONF-49/P/287 p0098 N72-16196 #
 A/CONF-49/P/359 p0098 N72-16981 #
 A/CONF-49/P/420 p0018 N72-16982 #
 ACIC-TC-1217 p0078 N68-10240 #
 AD-656991 p0078 N68-10240 #
 AD-659813 p0191 N68-11503 #
 AD-660438 p0079 N68-12884 #
 AD-660882 p0192 N68-11928 #
 AD-661771 p0192 N68-13094 #
 AD-662234 p0194 N68-15712 #
 AD-662235 p0193 N68-15525 #
 AD-662236 p0193 N68-15641 #
 AD-662486 p0079 N68-15630 #
 AD-662770 p0193 N68-15230 #
 AD-663076 p0079 N68-15844 #
 AD-665435 p0200 N68-20884 #
 AD-665457 p0080 N68-21041 #
 AD-665484 p0200 N68-21051 #
 AD-666773 p0202 N68-23140 #
 AD-666969 p0263 N68-23614 #
 AD-668263 p0203 N68-26786 #
 AD-668454 p0202 N68-26537 #
 AD-670083 p0205 N68-30681 #
 AD-671527 p0205 N68-31787 #
 AD-671149 p0206 N68-31928 #
 AD-671685 p0203 N68-28714 #
 AD-672686 p0206 N68-35442 #
 AD-672687 p0206 N68-35663 #
 AD-672772 p0206 N68-35232 #
 AD-673292 p0207 N68-37342 #
 AD-674339 p0011 N68-38243 #
 AD-674611 p0012 N69-13314 #
 AC-675936 p0264 N69-11907 #
 AD-680712 p0220 N69-26620 #
 AD-680804 p0083 N69-20205 #
 AD-681068 p0217 N69-20548 #
 AD-682791 p0084 N69-26099 #
 AD-682898 p0219 N69-25803 #
 AD-683118 p0220 N69-26520 #
 AD-683130 p0013 N69-26227 #
 AD-683131 p0220 N69-27379 #
 AD-683793 p0220 N69-27071 #
 AD-683989 p0219 N69-26189 #
 AD-684339 p0221 N69-28781 #
 AD-685487 p0221 N69-29892 #
 AD-685511 p0222 N69-29923 #
 AD-685523 p0221 N69-29843 #
 AD-685535 p0116 N69-29919 #

AD-685536 p0221 N69-29842 #
 AD-686000 p0222 N69-32347 #
 AD-687131 p0223 N69-32804 #
 AD-688393 p0224 N69-35280 #
 AD-690542 p0225 N69-39863 #
 AD-690786 p0227 N70-13348 #
 AD-691213 p0225 N69-40031 #
 AD-691465 p0225 N69-40792 #
 AD-692538 p0226 N70-10447 #
 AD-693153 p0226 N70-11420 #
 AD-693235 p0056 N70-11427 #
 AD-693847 p0227 N70-13293 #
 AD-694039 p0228 N70-14933 #
 AD-694396 p0227 N70-13251 #
 AD-694529 p0228 N70-15650 #
 AD-694781 p0258 N70-14391 #
 AD-694842 p0227 N70-14488 #
 AD-696428 p0230 N70-21253 #
 AD-696497 p0229 N70-18341 #
 AD-696588 p0117 N70-18542 #
 AD-697906 p0265 N70-22537 #
 AD-698440 p0092 N70-23046 #
 AD-698546 p0092 N70-23047 #
 AD-698547 p0092 N70-23048 #
 AD-698548 p0092 N70-23049 #
 AD-699311 p0231 N70-23985 #
 AD-699661 p0231 N70-25577 #
 AD-699944 p0232 N70-26434 #
 AD-700500 p0058 N70-29273 #
 AD-700689 p0093 N70-35477 #
 AD-700945 p0232 N70-26947 #
 AD-701352 p0233 N70-29518 #
 AD-702405 p0233 N70-29012 #
 AD-703158 p0236 N70-36408 #
 AD-703314 p0234 N70-31999 #
 AD-704002 p0059 N70-36227 #
 AD-704754 p0059 N70-32426 #
 AD-705159 p0235 N70-32986 #
 AD-705160 p0234 N70-32778 #
 AD-705748 p0235 N70-38959 #
 AD-706160 p0236 N70-37638 #
 AD-706643 p0237 N70-38631 #
 AD-706779 p0237 N70-37715 #
 AD-707178 p0016 N70-37672 #
 AD-707345 p0059 N70-38210 #
 AD-707803 p0237 N70-40031 #
 AD-709387 p0238 N70-42951 #
 AD-709982 p0258 N70-42226 #
 AD-711351 p0238 N71-10992 #
 AD-712738 p0238 N71-12372 #
 AD-713875 p0240 N71-16314 #
 AD-714681 p0095 N71-21304*#
 AD-716415 p0094 N71-19770 #
 AD-718833 p0016 N71-23353 #
 AD-719381 p0241 N71-24680 #
 AD-720257 p0241 N71-26190 #
 AD-721454 p0242 N71-28680 #
 AD-721455 p0242 N71-28718 #
 AD-723315 p0062 N71-31939 #
 AD-724973 p0245 N72-10782 #
 AD-725739 p0245 N72-11065 #
 AD-726588 p0244 N71-37309 #
 AD-727094 p0244 N71-38510 #
 AD-727461 p0244 N71-38010 #
 AD-727497 p0244 N71-37624 #
 AD-728407 p0246 N72-13211 #
 AD-728422 p0098 N72-14478 #
 AD-728551 p0098 N72-14402 #
 AD-728591 p0246 N72-13698 #
 AD-730450 p0247 N72-15235 #
 AD-730796 p0246 N72-14040 #
 AD-733931 p0118 N72-18520 #
 AD-734809 p0063 N72-19066 #
 AD-735660 p0247 N72-21497 #
 AD-735943 p0099 N72-23655 #

REPORT/ACCESSION NUMBER INDEX

AD-737019 p0178 A72-22401
 AD-737372 p0100 N72-23806 #
 AD-737720 p0247 N72-24139 #
 AD-739325 p0248 N72-27067 #
 AD-740572 p0248 N72-29734 #
 AD-741173 p0179 A72-29355 #
 AD-741858 p0248 N72-29045 #
 AD-741880 p0064 N72-29046 #
 AD-742641 p0101 N72-31082 #
 AD-743031 p0064 N72-31083 #
 AD-743651 p0249 N72-33065 #
 AD-743703 p0102 N72-33736 #
 AD-744477 p0249 N72-32078 #
 AD-744806 p0249 N72-33068 #
 AD-745245 p0249 N72-33063 #
 AD-745321 p0249 N73-10247 #
 AD-745322 p0250 N73-11717 #
 AD-747293 p0065 N73-11050 #
 AD-747323 p0250 N73-12064 #
 AD-747512 p0250 N73-13056 #
 AD-747661 p0250 N73-12068 #
 AD-747681 p0250 N73-12800 #
 AD-748211 p0267 N73-13997 #
 AD-748707 p0250 N73-13061 #
 AD-750128 p0104 N73-15454 #
 AD-751251 p0251 N73-16036 #
 AD-751465 p0252 N73-16718 #
 AD-753031 p0252 N73-18090 #
 AD-753828 p0020 N73-18093 #
 AD-754824 p0106 N73-20819 #
 AD-755151 p0106 N73-20815 #
 AD-755359 p0267 N73-23014 #
 AD-755360 p0267 N73-26054 #
 AD-755711 p0252 N73-22702 #
 AD-755829 p0067 N73-21712 #
 AD-756039 p0067 N73-21973 #
 AD-756433 p0252 N73-22168 #
 AD-756489 p0253 N73-23765 #
 AD-756594 p0067 N73-21960 #
 AD-757087 p0067 N73-23015 #
 AD-758783 p0253 N73-25106 #
 AD-759812 p0068 N73-25104 #
 AD-762934 p0254 N73-30890 #
 AD-764153 p0254 N73-31848 #
 AD-764285 p0254 N73-30979 #
 AD-764357 p0068 N73-30982 #
 AD-764530 p0255 N73-33009 #
 AD-764925 p0254 N73-31996 #
 AD-765783 p0069 N73-33011 #
 AE-341 p0217 N69-21373 #
 AE-355 p0224 N69-35785 #
 AEC-TR-6859 p0081 N68-22608 #
 AEC-TR-7102/3 p0245 N72-11610 #
 AEC-TR-7148 p0237 N70-38825 #
 AEC-TR-7161 p0239 N71-15010 #
 AED-R-3443 p0055 N69-32305 #
 AED-R-3472 p0055 N69-38442 #
 AED-R-3692P p0060 N71-16472 #
 AES-8 p0099 N72-20603 #
 AFAPL-TR-68-141 p0220 N69-27071 #
 AFAPL-TR-69-72 p0228 N70-14933 #
 AFAPL-TR-70-71-PT-2 p0100 N72-23806 #
 AFAPL-TR-71-5 p0245 N72-11065 #
 AFAPL-TR-71-11 p0247 N72-21497 #
 AFAPL-TR-71-45 p0248 N72-29734 #
 AFAPL-TR-72-32-VOL-1 p0249 N73-10247 #
 AFAPL-TR-72-38-VOL-1 p0267 N73-23014 #
 AFAPL-TR-72-38-VOL-3 p0267 N73-26054 #
 AFAPL-TR-72-98 p0253 N73-23765 #
 AFAPL-TR-73-4 p0068 N73-30982 #
 AFAPL-TR-73-5 p0253 N73-25106 #
 AFAPL-TR-73-16 p0254 N73-30890 #
 AFCL-TR-72-0032-VOL-2 p0250 N73-11717 #
 AFCL-67-0512 p0200 N68-21051 #
 AFOSR-67-2176 p0192 N68-11928 #
 AFOSR-68-C859 p0202 N68-26537 #
 AFOSP-68-1298 p0205 N68-31787 #
 AFOSR-68-1377 p0206 N68-31928 #
 AFOSR-70-1059TR p0235 N70-32986 #
 AFOSR-70-1061TR p0234 N70-32778 #
 AFOSR-71-2232TR p0238 N71-12372 #

AFOSR-71-0843TR p0242 N71-28680 #
 AFOSR-71-0853TR p0242 N71-28718 #
 AFOSR-72-0996TR p0179 A72-29355 #
 AFOSR-72-1959TR p0104 N73-15454 #
 AGARD-CP-21 p0203 N68-28714 #
 AGARDOGRAPH 81 p0024 A68-22516*
 AGARDOGRAPH 81 p0024 A68-22525
 AGARDOGRAPH 81 p0123 A68-22530
 AGARDOGRAPH 81 p0123 A68-22531
 AGARDOGRAPH 81 p0124 A68-22534
 AGARDOGRAPH 81 p0124 A68-22535
 AGARDOGRAPH 81 p0124 A68-22536
 AGARDOGRAPH 81 p0124 A68-22537
 AGARDOGRAPH 81 p0124 A68-22538
 AGARDOGRAPH 81 p0125 A68-22539
 AGARDOGRAPH 81 p0125 A68-22540
 AGARDOGRAPH 81 p0125 A68-22541
 AGARDOGRAPH 81 p0261 A68-22542*
 AGARDOGRAPH 81 p0125 A68-22545*
 AGARDOGRAPH 81 p0125 A68-22547
 AGARDOGRAPH 81 p0125 A68-22548
 AGARDOGRAPH 81 p0126 A68-22549
 AGARDOGRAPH-81 p0195 N68-17793
 AGARDOGRAPH-122 p0215 N69-18439 #
 AGARDOGRAPH-123-PT-1 p0228 N70-16217 #
 AGC-1335-2 p0098 N72-14402 #
 AI-CB-73 p0078 N68-11281 #
 AI-67-138 p0192 N68-11928 #
 AI-69-112 p0232 N70-26947 #
 AIAA PAPER 68-122 p0120 A68-17540*
 AIAA PAPER 68-997 p0072 A68-45023 #
 AIAA PAPER 68-997 p0073 A71-24852 #
 AIAA PAPER 68-1091 p0072 A68-44975 #
 AIAA PAPER 68-1091 p0115 A69-33725 #
 AIAA PAPER 69-588 p0072 A69-33265 #
 AIAA PAPER 70-40 p0163 A70-18107 #
 AIAA PAPER 70-738 p0032 A70-25434 #
 AIAA PAPER 70-1221 p0008 A71-22779*
 AIAA PAPER 70-1225 p0170 A70-45956 #
 AIAA PAPER 71-825 p0174 A71-34720 #
 AIAA PAPER 72-57 p0037 A72-16909 #
 AIAA PAPER 72-103 p0177 A72-16936*
 AIAA PAPER 72-449 p0115 A72-26186 #
 AIAA PAPER 72-1059 p0182 A73-13388*
 AIAA PAPER 73-15 p0009 A73-17608*
 AIAA PAPER 73-58 p0009 A73-17631*
 AIAA PAPER 73-82 p0183 A73-17641 #
 AIAA PAPER 73-258 p0183 A73-17667*
 AIAA PAPER 73-259 p0182 A73-16980 #
 AIAA PAPER 73-701 p0076 A73-36250 #
 AIAA PAPER 73-710 p0045 A73-36331 #
 AIAA PAPER 73-809 p0009 A73-38373*
 AMRL-TR-67-158 p0080 N68-21041 #
 AMS-643 p0055 N69-38783*
 ANL-TRANS-508 p0192 N68-12691 #
 ANL-TRANS-704 p0084 N69-25563 #
 ANL-7025 p0012 N69-15807 #
 ANL-7575 p0090 N70-19586 #
 ANL-7953 p0267 N73-19061 #
 ANL-7958 p0268 N73-30058 #
 ANL/ES-CEN-1003 p0095 N71-36736 #
 ANL/ETD-72-07 p0250 N73-12064 #
 AP-42-REV p0099 N72-19686 #
 AP-52 p0015 N70-34670 #
 APL-TG-1081 p0265 N70-22537 #
 APL-TG-1103 p0059 N70-38210 #
 APR-1 p0095 N71-22717 #
 APTD-0643 p0017 N71-31900 #
 ARC-R-423 p0266 N72-17020*
 ARL-69-0076 p0228 N70-15650 #
 ARL-70-0244 p0241 N71-26190 #

REPORT/ACCESSION NUMBER INDEX

ARL-71-0015	p0062	N71-31939 *	CEA-R-3834	p0225	N69-40586 *
ARL-71-0291	p0178	A72-22401	CLM-R-85	p0202	N68-25016 *
ASME PAPER 68-WA/SOL-1	p0141	A69-16158**	CM-28/K-1	p0244	N71-38463 *
ASME PAPER 69-WA/SOL-1	p0028	A69-36418**	CNEA-192	p0079	N68-17192 *
ASME PAPER 69-WA/ENER-12	p0163	A70-14897 *	CONF-660837-1	p0202	N68-26381 *
ASME PAPER 69-WA/ENER-14	p0163	A70-14896**	CONF-671008-2	p0078	N68-12553 *
ASME PAPER 69-WA/HT-51	p0163	A70-14797**	CONF-671191-5	p0081	N68-29161 *
ASME PAPER 69-WA/PWR-12	p0163	A70-14754 *	CONF-671115-1	p0010	N68-18384 *
ASME PAPER 70-ENER-A	p0171	A71-13704 *	CONF-680502-2	p0010	N68-28181 *
ASME PAPER 71-AV-37	p0174	A71-36404**	CONF-680508-9	p0218	N69-24985 *
ASME PAPER 71-WA/ENER-1	p0177	A72-15940 *	CONF-680541-1	p0257	N69-27096 *
ASME PAPER 71-WA/SOL-1	p0036	A72-15891 *	CONF-680610	p0087	N69-37355 *
ASME PAPER 71-WA/SOL-2	p0036	A72-15892**	CONF-680626-1	p0264	N69-14302 *
ASME PAPER 71-WA/SOL-10	p0037	A72-15893**	CONF-680704-1	p0205	N68-31910 *
ASME PAPER 72-AERO-11	p0008	A72-43147 *	CONF-680704-3	p0214	N69-15430 *
ASME PAPER 72-AERO-12	p0181	A72-43148**	CONF-680802-1	p0206	N68-34481 *
ASME PAPER 72-GT-33	p0178	A72-25629 *	CONF-680802-6	p0218	N69-23173 *
ASME PAPER 72-WA/GT-3	p0075	A73-15867 *	CONF-680813-3	p0218	N69-22640 *
ASME PAPER 72-WA/SOL-6	p0042	A73-15801 *	CONF-680824-1	p0082	N69-15237 *
ASME PAPER 72-WA/SOL-7	p0042	A73-15802 *	CONF-681040-1	p0084	N69-25563 *
ASME PAPER 73-ENAS-7	p0045	A73-37969 *	CONF-681040-9	p0083	N69-25510 *
ASME PAPER 73-ICT-104	p0010	A73-43499**	CONF-690815-3	p0090	N70-17649 *
AVSD-0306-69-RR	p0223	N69-34989**	CONF-690901-7	p0092	N70-28899 *
AVSSD-0071-68-CR	p0081	N68-25283**	CONF-690905-1	p0226	N70-12638 *
BIBLIOGRAPHIC-LIST-7	p0099	N72-23655 *	CONF-691108-2	p0015	N70-37081 *
BLG-427	p0223	N69-32934 *	CONF-691122-3	p0093	N70-39139 *
BM-IC-8526	p0096	N71-36393 *	CONF-700810-20	p0016	N71-13756 *
BM-IC-8530	p0107	N73-24432 *	CONF-700912-3	p0239	N71-15242 *
BM-IC-8551	p0101	N72-30123 *	CONF-700915-5	p0240	N71-15736 *
BM-IC-8612	p0111	N73-30335 *	CONF-701022-1	p0094	N71-21050 *
BM-MTB-170-VOL-2	p0108	N73-25411 *	CONF-710444-6	p0248	N72-28731 *
BM-RI-7061	p0116	N68-12434 *	CONF-710607-126	p0244	N71-38463 *
BM-RI-7291	p0117	N70-20511 *	CONF-710829-1	p0019	N73-12741 *
BM-RI-7634	p0100	N72-25584 *	CONF-710901-106	p0098	N72-16196 *
BM-RI-7672	p0101	N72-31768 *	CONF-710901-123	p0098	N72-16981 *
BM-RI-7699	p0251	N73-14746 *	CONF-710901-439	p0018	N72-16982 *
BM-RI-7717	p0253	N73-25102 *	CONF-720518-1	p0065	N73-12061 *
BM-RI-7756	p0109	N73-27542 *	CONF-720519-1	p0103	N73-12717 *
BMBW-FB-W-70-16	p0233	N70-30407 *	CONF-730416-2	p0022	N73-33005 *
BMPER-2	p0107	N73-22284**	CONF-730811-6	p0068	N73-33007 *
BMPER-35	p0190	N68-10758 *	DAC-62304-VOL-2	p0214	N69-14760**
BMRI-7390	p0092	N70-28685 *	DDC-TAS-69-5-VOL-1	p0222	N69-32347 *
BMMF-PD-W-68-10	p0202	N68-24189 *	DDC-TAS-69-74-1-VOL-1	p0058	N70-29273 *
BNL-12319	p0202	N68-26381 *	DGLR-PAPER-72-091	p0066	N73-15084 *
BNL-12569	p0082	N69-11230 *	DGLR-68-003	p0048	N68-22010 *
BNL-16228	p0018	N72-20371 *	DGLR-68-005	p0201	N68-22013 *
BNWL-SA-2065	p0082	N69-15237 *	DIN-685D4299	p0051	N68-33207**
BNWL-SA-3605	p0094	N71-21050 *	DLR-FB-67-59	p0191	N68-11139 *
BNWL-851	p0082	N69-15543 *	DLR-FB-67-71	p0193	N68-14746 *
BNWL-1115	p0224	N69-38506 *	DLR-FB-69-85	p0232	N70-26208 *
BR-29829	p0067	N73-21959 *	DLR-FB-69-85	p0239	N71-15010 *
BSR-3489	p0103	N73-13334**	DLR-FB-70-25	p0240	N71-17840 *
BSR-3661	p0106	N73-20413**	DLR-FB-71-74	p0251	N73-15757 *
BULL-22	p0068	N73-26976**	DLR-FB-72-10	p0267	N72-26656 *
BULL-22	p0069	N73-33762 *	DLR-HITT-70-09	p0239	N71-15723 *
CASI PAPER 72/10	p0174	A71-37600	DOC.-68SD4222	p0202	N68-24455**
CEA-BIB-129-ADD-1	p0104	N73-17719 *	DOC.-68SD4246	p0048	N68-21879**
CEA-BIB-190	p0244	N71-37044 *	DOC-69SD4225	p0054	N69-29374**
CEA-CONF-1041	p0218	N69-24985 *	DOC-70SD4	p0234	N70-31999 *
CEA-CONF-1093	p0257	N69-27096 *	DOC-70SD261	p0237	N70-40031 *
CEA-CONF-1195	p0083	N69-25510 *	DOC-70SD4286-VOL-2	p0061	N71-23714**
CEA-CONF-1534	p0093	N70-39139 *	DOC-72SD4249	p0066	N73-15079**
CEA-R-3243	p0263	N68-15938 *	DP-1192-1	p0086	N69-31541 *
CEA-R-3243	p0266	N71-23515**	DVI-683	p0193	N68-14746 *
CEA-R-3564	p0221	N69-27494 *	D2-113355-6, PT. 1	p0051	N68-31404**
CEA-R-3714	p0222	N69-30078 *	D180-12700-1	p0063	N72-14029**
CEA-R-3731	p0087	N69-38022 *	E-5135	p0226	N70-11975**
			E-5701	p0117	N70-42326**
			E-5789	p0238	N71-11689**
			E-5830	p0240	N71-17933**
			E-5990	p0061	N71-20471**
			E-6031	p0094	N71-20533**

REPORT/ACCESSION NUMBER INDEX

E-6247	.....	p0096	N71-31456*	E73-10731	.....	p0108	N73-26337*
E-6304	.....	p0241	N71-24578*	E73-10776	.....	p0108	N73-27252*
E-6352	.....	p0243	N71-35233*	E73-10802	.....	p0109	N73-27277*
E-6436	.....	p0247	N72-24755*	E73-10843	.....	p0110	N73-28421*
E-6442	.....	p0244	N71-36450*	E73-10874	.....	p0111	N73-29225*
E-6674	.....	p0017	N72-11844*	E73-10970	.....	p0111	N73-30311*
E-6675	.....	p0063	N72-19057*	E73-10987	.....	p0112	N73-31294*
E-6859	.....	p0063	N72-21033*	E73-11033	.....	p0112	N73-31337*
E-6862	.....	p0248	N72-28685*	E73-11034	.....	p0112	N73-31338*
E-6890	.....	p0247	N72-23675*	E73-11035	.....	p0112	N73-31339*
E-6904	.....	p0063	N72-25022*	E73-11053	.....	p0112	N73-32229*
E-7078	.....	p0104	N73-16771*	E73-11107	.....	p0112	N73-33264*
E-7118	.....	p0102	N72-32754*	E73-11112	.....	p0112	N73-33269*
E-7210	.....	p0258	N73-18981*				
E-7224	.....	p0020	N73-15693*	FAA-DS-70-13	.....	p0093	N70-34002 *
E-7236	.....	p0105	N73-18960*	FAA-NA-70-45	.....	p0093	N70-34002 *
E-7425	.....	p0020	N73-22711*	FHL-PUBL-71-14	.....	p0098	N72-16934 *
E-7439	.....	p0067	N73-22748*	FOA-4-C-4325-55	.....	p0223	N69-35224 *
E-7490	.....	p0021	N73-24777*	FR-2	.....	p0098	N72-14402 *
E-7670	.....	p0068	N73-32655*	FR-2390	.....	p0236	N70-36860*
				FR-4045	.....	p0063	N72-13046*
				FR-5295	.....	p0104	N73-17916*
ECOM-0136-F	.....	p0249	N72-32078 *	FRNC-CONF-13	.....	p0248	N72-28731 *
ECOM-0153-P	.....	p0118	N72-18520 *	FSTC-HT-23-113-72	.....	p0067	N73-21960 *
ECOM-0376-1	.....	p0200	N68-20884 *	FSTC-HT-23-568-68	.....	p0224	N69-35280 *
ECOM-2929	.....	p0202	N68-23140 *	FSTC-HT-23-785-68	.....	p0083	N69-20205 *
ECOM-3154	.....	p0227	N70-13293 *	FSTC-HT-23-785-71	.....	p0246	N72-13698 *
ECOM-3197	.....	p0231	N70-23985 *	FSTC-HT-23-921-72	.....	p0067	N73-21973 *
ECOM-3452	.....	p0063	N72-19066 *	FSTC-HT-23-922-72	.....	p0069	N73-33011 *
ECOM-4064	.....	p0252	N73-22168 *	FSTC-HT-23-960-72	.....	p0250	N73-13056 *
ECOM-02290-F	.....	p0205	N68-30681 *	FSTC-HT-23-1004-72	.....	p0064	N72-29046 *
				FSTC-HT-23-1023-72	.....	p0248	N72-29045 *
EIS-AA-72-5242-D-1-VOL-1	.....	p0111	N73-29367 *	FSTC-HT-23-1088-72	.....	p0020	N73-18093 *
EIS-AA-72-5242-D-2-VOL-2	.....	p0021	N73-29368 *	FSTC-HT-23-1208-72	.....	p0067	N73-21712 *
EOS-7254-0-2	.....	p0046	N68-14185**	FSTC-HT-23-1429-71	.....	p0065	N73-11950 *
ESRO-CR-12	.....	p0058	N70-30140 *	FSTC-HT-23-1433-72	.....	p0068	N73-25104 *
ESRO-SF-45	.....	p0226	N70-11301 *	FSTC-HT-23-1434-71	.....	p0101	N72-31082 *
ESRO-TM-P-5/ESTEC/	.....	p0052	N69-15891 *	FSTC-HT-23-1434-72	.....	p0067	N73-23015 *
ESRO-TM-54/ESTEC/	.....	p0047	N68-18466 *	FSTC-HT-23-1577-71	.....	p0064	N72-31083 *
ESRO-TN-79	.....	p0058	N70-30210 *	FSTC-HT-23-2007-72	.....	p0254	N73-31848 *
ESRO-TN-83	.....	p0057	N70-17621 *				
EUFNR-608	.....	p0085	N69-31161 *	FTD-HC-23-738-72	.....	p0252	N73-22702 *
				FTD-HT-23-27-68	.....	p0084	N69-26099 *
EUR-3613.F	.....	p0078	N68-10864 *	FTD-HT-23-42-70	.....	p0059	N70-36227 *
EUR-3721.E	.....	p0085	N69-31161 *	FTD-HT-23-62-70	.....	p0059	N70-32426 *
EUR-3690.I	.....	p0081	N68-23663 *	FTD-HT-23-213-70	.....	p0016	N70-37672 *
EUR-4162	.....	p0086	N69-31655 *	FTD-HT-23-237-69	.....	p0237	N70-38631 *
EUR-4243.F	.....	p0085	N69-31119 *	FTD-HT-23-277-69	.....	p0093	N70-35477 *
EUR-4264.E	.....	p0085	N69-31081 *	FTD-HT-23-343-68	.....	p0013	N69-26227 *
EUR-4273.D	.....	p0086	N69-34967 *	FTD-HT-23-347-68-PT-1	.....	p0092	N70-23046 *
EUR-4838	.....	p0020	N73-15699 *	FTD-HT-23-347-68-PT-2	.....	p0092	N70-23047 *
				FTD-HT-23-347-68-PT-3	.....	p0092	N70-23048 *
EURFNR-615	.....	p0086	N69-31655 *	FTD-HT-23-347-68-PT-4	.....	p0092	N70-23049 *
				FTD-HT-23-559-72	.....	p0251	N73-16036 *
E72-19020	.....	p0101	N72-29272*	FTD-HT-23-584-68	.....	p0116	N69-29919 *
E72-10064	.....	p0102	N72-32336*	FTD-HT-23-586-68	.....	p0220	N69-26620 *
E72-10069	.....	p0101	N72-31353*	FTD-HT-23-593-72	.....	p0252	N73-18090 *
E72-10193	.....	p0102	N73-10372*	FTD-HT-23-858-67	.....	p0220	N69-26520 *
E72-10256	.....	p0102	N73-12356*	FTD-HT-23-894-70	.....	p0244	N71-37624 *
E72-10265	.....	p0103	N73-12364*	FTD-HT-23-898-70	.....	p0244	N71-37309 *
E72-10284	.....	p0103	N73-13334*	FTD-HT-23-899-70	.....	p0244	N71-38010 *
E72-10327	.....	p0103	N73-14315*	FTD-HT-23-1508-68	.....	p0227	N70-13251 *
E72-10355	.....	p0103	N73-14343*	FTD-HT-24-356-69	.....	p0237	N70-37715 *
E73-10003	.....	p0019	N73-15339*	FTD-HT-66-378	.....	p0192	N68-13094 *
E73-10004	.....	p0104	N73-15340*	FTD-HT-66-746	.....	p0079	N68-12884 *
E73-10032	.....	p0104	N73-15365*	FTD-HT-67-195	.....	p0012	N69-13314 *
E73-10096	.....	p0105	N73-18321*				
E73-10121	.....	p0105	N73-18353*	FTD-MT-24-20-69	.....	p0258	N70-14391 *
E73-10322	.....	p0105	N73-18354*	FTD-MT-24-39-69	.....	p0229	N70-18341 *
E73-10371	.....	p0105	N73-19366*	FTD-MT-24-53-69	.....	p0227	N70-13348 *
E73-10414	.....	p0105	N73-20376*	FTD-MT-24-114-70	.....	p0240	N71-16314 *
E73-10430	.....	p0106	N73-20391*	FTD-MT-24-150-69	.....	p0236	N70-36408 *
E73-10444	.....	p0106	N73-20404*	FTD-MT-24-154-69	.....	p0231	N70-25577 *
E73-10454	.....	p0106	N73-20413*	FTD-MT-24-173-68	.....	p0221	N69-29843 *
E73-10478	.....	p0107	N73-21315*	FTD-MT-24-174-68	.....	p0221	N69-29892 *
E73-10509	.....	p0107	N73-22284*	FTD-MT-24-175-68	.....	p0220	N69-27397 *
E73-10523	.....	p0107	N73-23414*	FTD-MT-24-177-68	.....	p0221	N69-29842 *
E73-10641	.....	p0107	N73-25338*	FTD-MT-24-183-68	.....	p0222	N69-29923 *
E73-10646	.....	p0108	N73-25342*	FTD-MT-24-205-67	.....	p0206	N68-35842 *
E73-10661	.....	p0108	N73-25357*	FTD-MT-24-208-67	.....	p0206	N68-35663 *
E73-10661	.....	p0108	N73-25386*	FTD-MT-24-253-70	.....	p0245	N72-10782 *
E73-10694	.....	p0108	N73-25392*	FTD-MT-24-294-69	.....	p0236	N70-37638 *
E73-10700	.....	p0108	N73-25392*				

REPORT/ACCESSION NUMBER INDEX

FTD-MT-24-375-68	p0219	N69-26189 *	JPRS-57940-2-PT-2	p0251	N73-16688 *
FTD-MT-24-445-69	p0235	N70-34959 *	JPRS-59496	p0109	N73-27324 *
FTD-MT-24-521-68	p0227	N70-14488 *			
FTD-MT-24-713-73	p0254	N73-31996 *	JUL-510-TP	p0201	N68-21331 *
FTD-MT-24-1464-71	p0250	N73-13061 *	JUL-554-RG	p0264	N69-13298 *
FTD-MT-24-1635-71	p0249	N72-33063 *	JUL-689-TP	p0242	N71-30458 *
FTD-MT-24-1687-71	p0249	N72-33065 *	JUL-706-TP	p0242	N71-27918 *
FTD-MT-24-2001-71	p0252	N73-16718 *	JUL-742-TP	p0245	N72-11639 *
FTD-MT-64-355	p0203	N68-26786 *	JUL-883-TP	p0252	N73-22662 *
			JUL-892-TP-VOL-11	p0254	N73-30699 *
GA-8032	p0081	N68-29161 *	KFK-466	p0081	N68-22608 *
GA-9889	p0094	N71-15083 *	KFK-847	p0085	N69-31161 *
GAMD-8661	p0083	N69-17117 *	KFK-883	p0086	N69-31655 *
GAT-553	p0010	N68-25106 *	KFK-894	p0230	N70-22247 *
GE-ANSO-6300-203	p0190	N68-10050 *	KURRI-TR-56	p0091	N70-21010 *
GESP-451	p0173	A71-32223	L-5484	p0049	N68-27926 *
GESP-623	p0174	A71-33525 *	L-6837	p0058	N70-29807 *
GESP-9001	p0222	N69-32553 *	L-7865	p0244	N71-36452 *
HIT-206	p0049	N68-23987 *	LA-DC-72-868	p0065	N73-12061 *
HREC-5986-3	p0066	N73-17911 *	LA-DC-9519	p0010	N68-28181 *
HT-66-0207	p0057	N70-20627 *	LA-DC-9686	p0264	N69-14302 *
H500-12-3-1	p0254	N73-30890 *	LA-DC-12990	p0267	N72-17829 *
IAE-1347	p0206	N68-35663 *	LA-TR-70-9	p0265	N71-11913 *
IAE-1701	p0235	N70-33216 *	LA-4697	p0097	N72-12617 *
IAEA-SM-146/5	p0017	N71-35176 *	LC-72-600266	p0253	N73-26045 *
ICAS PAPER 70-16	p0115	A70-44127 *	LIT/TRANS-240	p0093	N70-33032 *
IDA/HQ-68-8703	p0264	N69-11907 *	LMSC-MEMO-69-7-VOL-1	p0234	N70-31239 *
IDO-17277	p0088	N70-13396 *	LMSC-MEMO-69-7-VOL-2	p0234	N70-31812 *
IECPC PAPER 739028	p0116	A73-38436 *	LMSC-A941440-REV	p0058	N70-28421 *
IN-1313	p0088	N70-13396 *	LMSC-A981486	p0060	N71-16462 *
INDEC-SR-13	p0010	N68-21035 *	LMSC-A981486	p0065	N72-33057 *
INDEC-SR-14	p0207	N69-10111 *	LMSC-D0079115	p0266	N72-11410 *
INDEC-SR-15	p0223	N69-34810 *	LMSC/HREC-D306275	p0066	N73-17911 *
INFCIRC/139/ADD-1	p0017	N71-33879 *	LHP-63/73	p0021	N73-30975 *
INR-1095	p0235	N70-33547 *	M-7428	p0011	N68-35752
INR-1096	p0235	N70-33672 *	MAS-9	p0112	N73-32300 *
INR-1107	p0235	N70-33335 *	MATT-659	p0218	N69-23954 *
INR-1199	p0241	N71-27207 *	MATT-803	p0246	N72-11641 *
IPP-2/211	p0268	N73-31676 *	MITRE-72-164	p0020	N73-20997 *
IPP-3/59	p0190	N68-10892 *	MITRE-72-180-REV-2	p0020	N73-20820 *
IPP-3/68	p0207	N68-38458 *	MLM-1532	p0082	N69-15081 *
IPP-3/97	p0230	N70-21895 *	MMN-3691-20	p0191	N68-11382 *
IPP-3/104	p0234	N70-31285 *	MMN-3691-62	p0239	N71-15039 *
ISBN-90-6144-031-9	p0253	N73-23757 *	MND-3607-239-3, V. 3	p0207	N68-37951 *
ITP-69-7	p0223	N69-34199 *	MRB4026P	p0191	N68-11503 *
IYA-MEED-167	p0096	N71-30522 *	MSC-IN-67-EP-24	p0048	N68-23182 *
JPRS-48041	p0219	N69-26241 *	MSC-07163	p0068	N73-30057 *
JPL-TR-32-1244	p0201	N68-21597 *	N7	p0054	N69-24313 *
JPL-TR-32-1328	p0133	A68-39723 *	N70-45	p0097	N72-10830 *
JPL-TR-32-1371	p0217	N69-21376 *	NAEC-GSED-59	p0106	N73-20815 *
JPL-TR-32-1502	p0060	N71-13427 *	NASA FACTS S-6/3-68	p0051	N68-31526 *
JPL-TR-32-1519	p0061	N71-20727 *	NASA FACTS-WF-38	p0048	N68-19128 *
JPL-TR-32-1555	p0101	N72-26528 *	NASA-CASE-ARC-10050	p0062	N71-33409 *
JPL-TR-32-1558	p0064	N72-26034 *	NASA-CASE-ARC-10461-1	p0252	N73-20931 *
JPL-TR-32-1562	p0065	N72-32070 *	NASA-CASE-GSC-10945-1	p0065	N72-31637 *
JPL-TR-32-1573	p0065	N72-33061 *	NASA-CASE-GSC-11394-1	p0254	N73-32109 *
JPRS-43265	p0010	N68-10725 *	NASA-CASE-HQN-10792-1	p0248	N72-27230 *
JPRS-46752	p0208	N69-11943 *	NASA-CASE-HQN-10793-1	p0248	N72-27230 *
JPRS-46941	p0214	N69-13670 *	NASA-CASE-LAR-10373-1	p0062	N71-26155 *
JPRS-48150	p0084	N69-29789 *			
JPRS-48222	p0054	N69-30038 *			
JPRS-53174	p0016	N71-26623 *			
JPRS-55126	p0247	N72-17956 *			
JPRS-57940-1-PT-1	p0251	N73-16687 *			

REPORT/ACCESSION NUMBER INDEX

NASA-CASE-NPO-10188	.....	p0061	N71-20273*	NASA-CR-107020	.....	p0087	N70-12263**
NASA-CASE-NPO-10753	.....	p0247	N72-26031*	NASA-CR-107560	.....	p0089	N70-15491**
NASA-CASE-YER-09521	.....	p0246	N72-12136*	NASA-CR-107857	.....	p0229	N70-17651**
NASA-CASE-XGS-00473	.....	p0265	N70-38713*	NASA-CR-108945	.....	p0057	N70-20627**
NASA-CASE-XGS-01395	.....	p0053	N69-21539**	NASA-CR-109527	.....	p0057	N70-25500**
NASA-CASE-XLA-03103	.....	p0240	N71-21693*	NASA-CR-110154	.....	p0233	N70-29169**
NASA-CASE-XLA-03374	.....	p0239	N71-15562*	NASA-CR-110370	.....	p0233	N70-29729**
NASA-CASE-XLE-00212	.....	p0235	N70-34134*	NASA-CR-110877	.....	p0238	N70-42733**
NASA-CASE-XLE-01015	.....	p0225	N69-39898**	NASA-CR-110913	.....	p0059	N70-43081**
NASA-CASE-XLE-01716	.....	p0059	N70-40234*	NASA-CR-112002	.....	p0063	N72-13046**
NASA-CASE-XLE-02083	.....	p0225	N69-39983**	NASA-CR-112204	.....	p0102	N73-11019**
NASA-CASE-XNP-00644	.....	p0236	N70-36803*	NASA-CR-114828	.....	p0060	N71-16462**
NASA-CASE-XNP-03413	.....	p0062	N71-26726*	NASA-CR-115572	.....	p0247	N72-23053**
NASA-CASE-XNP-03835	.....	p0095	N71-23499*	NASA-CR-115792	.....	p0266	N71-36441**
NASA-CASE-XNP-04111	.....	p0060	N71-15622*	NASA-CR-115821	.....	p0060	N71-13427**
NASA-CASE-XNP-05821	.....	p0060	N71-11056*	NASA-CR-116220	.....	p0060	N71-16472**
NASA-CASE-XNP-07481	.....	p0218	N69-21929**	NASA-CR-116510	.....	p0266	N71-17471**
NASA-CR-1416	.....	p0222	N69-32553**	NASA-CR-117349	.....	p0061	N71-20727**
NASA-CR-1563	.....	p0231	N70-25623**	NASA-CR-117497	.....	p0095	N71-21304**
NASA-CR-1971	.....	p0266	N72-17020**	NASA-CR-118006	.....	p0061	N71-23714**
NASA-CR-49827	.....	p0056	N70-12119**	NASA-CR-119945	.....	p0062	N71-36441**
NASA-CR-54752	.....	p0237	N70-42202**	NASA-CR-120840	.....	p0063	N72-14029**
NASA-CR-61979	.....	p0051	N68-36000**	NASA-CR-121003	.....	p0067	N73-20044**
NASA-CR-62045	.....	p0202	N68-24455**	NASA-CR-121094	.....	p0104	N73-17916**
NASA-CR-66832	.....	p0055	N69-38646**	NASA-CR-121751	.....	p0062	N71-34042**
NASA-CR-72307	.....	p0190	N68-10050**	NASA-CR-122296	.....	p0266	N72-11982**
NASA-CR-72340	.....	p0046	N68-12252**	NASA-CR-124063	.....	p0066	N73-17911**
NASA-CR-72366	.....	p0081	N68-25283**	NASA-CR-124608	.....	p0097	N72-12329**
NASA-CR-72436	.....	p0208	N69-10335**	NASA-CR-127031	.....	p0064	N72-26034**
NASA-CR-72439	.....	p0051	N68-33207**	NASA-CR-127045	.....	p0101	N72-26528**
NASA-CR-72477	.....	p0208	N69-12307**	NASA-CR-127234	.....	p0064	N72-27055**
NASA-CR-72529	.....	p0236	N70-36060**	NASA-CR-127744	.....	p0101	N72-29272**
NASA-CR-72534	.....	p0054	N69-23369**	NASA-CR-127891	.....	p0249	N72-30655**
NASA-CR-72555	.....	p0223	N69-34989**	NASA-CR-128080	.....	p0102	N72-32336**
NASA-CR-72706	.....	p0058	N70-28421**	NASA-CR-128084	.....	p0101	N72-31353**
NASA-CR-73225	.....	p0011	N68-28227**	NASA-CR-128196	.....	p0065	N72-32070**
NASA-CR-73280	.....	p0214	N69-14760**	NASA-CR-128381	.....	p0065	N72-33061**
NASA-CR-73444	.....	p0059	N70-37465**	NASA-CR-128391	.....	p0102	N73-10372**
NASA-CR-73711	.....	p0053	N69-16975**	NASA-CR-128519	.....	p0249	N72-30029**
NASA-CR-90210	.....	p0191	N68-11030**	NASA-CR-128533	.....	p0065	N72-33057**
NASA-CR-91730	.....	p0046	N68-14185**	NASA-CR-128930	.....	p0068	N73-30057**
NASA-CR-92520	.....	p0047	N68-16074**	NASA-CR-129188	.....	p0102	N73-12356**
NASA-CR-92586	.....	p0046	N68-15766**	NASA-CR-129191	.....	p0102	N73-12358**
NASA-CR-92679	.....	p0047	N68-16882**	NASA-CR-129227	.....	p0103	N73-12364**
NASA-CR-93111	.....	p0079	N68-17316**	NASA-CR-129273	.....	p0103	N73-13334**
NASA-CR-93979	.....	p0010	N68-21035**	NASA-CR-129585	.....	p0103	N73-14315**
NASA-CR-94154	.....	p0201	N68-21597**	NASA-CR-129595	.....	p0103	N73-13991**
NASA-CR-94243	.....	p0048	N68-21879**	NASA-CR-129611	.....	p0103	N73-13992**
NASA-CR-94402	.....	p0048	N68-22991**	NASA-CR-129668	.....	p0103	N73-14343**
NASA-CR-94551	.....	p0049	N68-23528**	NASA-CR-129927	.....	p0019	N73-15339**
NASA-CR-94615	.....	p0049	N68-23987**	NASA-CR-129928	.....	p0104	N73-15340**
NASA-CR-95263	.....	p0050	N68-27974**	NASA-CR-129985	.....	p0104	N73-15365**
NASA-CR-95999	.....	p0051	N68-31409**	NASA-CR-130287	.....	p0066	N73-15079**
NASA-CR-96230	.....	p0051	N68-32561**	NASA-CR-130345	.....	p0105	N73-18321**
NASA-CR-96813	.....	p0011	N68-34388**	NASA-CR-130739	.....	p0105	N73-18353**
NASA-CR-97077	.....	p0051	N68-35818**	NASA-CR-130740	.....	p0105	N73-18354**
NASA-CR-97208	.....	p0052	N68-36630**	NASA-CR-131012	.....	p0105	N73-19366**
NASA-CR-97473	.....	p0207	N69-10111**	NASA-CR-131090	.....	p0066	N73-19059**
NASA-CR-97864	.....	p0214	N69-13391**	NASA-CR-131150	.....	p0105	N73-20376**
NASA-CR-97872	.....	p0209	N69-13240**	NASA-CR-131220	.....	p0106	N73-20391**
NASA-CR-97876	.....	p0214	N69-13818**	NASA-CR-131239	.....	p0106	N73-20404**
NASA-CR-97877	.....	p0209	N69-13287**	NASA-CR-131254	.....	p0106	N73-20413**
NASA-CR-97878	.....	p0209	N69-13286**	NASA-CR-131283	.....	p0107	N73-21315**
NASA-CR-97879	.....	p0209	N69-13288**	NASA-CR-131469	.....	p0107	N73-22284**
NASA-CR-97883	.....	p0209	N69-13045**	NASA-CR-131490	.....	p0107	N73-23414**
NASA-CR-97885	.....	p0209	N69-13151**	NASA-CR-132100	.....	p0107	N73-25338**
NASA-CR-98712	.....	p0052	N69-14920**	NASA-CR-132170	.....	p0108	N73-25357**
NASA-CR-100038	.....	p0053	N69-18748**	NASA-CR-132980	.....	p0108	N73-25342**
NASA-CR-100500	.....	p0217	N69-21376**	NASA-CR-132998	.....	p0108	N73-25386**
NASA-CR-100529	.....	p0053	N69-22175**	NASA-CR-133013	.....	p0108	N73-25392**
NASA-CR-100629	.....	p0013	N69-39189**	NASA-CR-133075	.....	p0108	N73-26337**
NASA-CR-100706	.....	p0054	N69-29374**	NASA-CR-133101	.....	p0068	N73-26818**
NASA-CR-100813	.....	p0265	N69-24894**	NASA-CR-133143	.....	p0108	N73-27252**
NASA-CR-100892	.....	p0219	N69-25396**	NASA-CR-133209	.....	p0109	N73-27277**
NASA-CR-101384	.....	p0084	N69-28160**	NASA-CR-133422	.....	p0110	N73-28421**
NASA-CR-101745	.....	p0222	N69-30871**	NASA-CR-133491	.....	p0111	N73-29225**
NASA-CR-102111	.....	p0089	N70-16407**	NASA-CR-133749	.....	p0111	N73-30311**
NASA-CR-103418	.....	p0055	N69-32305**	NASA-CR-133766	.....	p0112	N73-31294**
NASA-CR-103989	.....	p0223	N69-34810**	NASA-CR-133854	.....	p0258	N73-30464**
NASA-CR-106009	.....	p0055	N69-38442**	NASA-CR-133865	.....	p0112	N73-31337**
NASA-CR-106089	.....	p0055	N69-38783**	NASA-CR-133866	.....	p0112	N73-31338**
NASA-CR-106379	.....	p0056	N69-40952**	NASA-CR-133881	.....	p0112	N73-31339**
				NASA-CR-133934	.....	p0112	N73-32229**
				NASA-CR-135510	.....	p0068	N73-30977**
				NASA-CR-135575	.....	p0112	N73-33264**
				NASA-CR-135581	.....	p0112	N73-33269**
				NASA-CR-135951	.....	p0259	N73-33900**
				NASA-CR-135952	.....	p0259	N73-33903**
				NASA-CR-135953	.....	p0258	N73-33900**

REPORT/ACCESSION NUMBER INDEX

NASA-CR-135955 p0259 N73-33902*#
 NASA-CR-135956 p0258 N73-33901*#

 NASA-SP-172 p0265 N69-18042*#
 NASA-SP-236 p0242 N71-33626*#
 NASA-SP-282 p0018 N72-13391*#
 NASA-SP-331 p0021 N73-31867*#
 NASA-SP-3074 p0104 N73-15309*#
 NASA-SP-5115 p0253 N73-26045*#

 NASA-TM-X-1453 p0193 N68-14630*#
 NASA-TM-X-1501 p0192 N68-14585*#
 NASA-TM-X-1503 p0047 N68-16695*#
 NASA-TM-X-1591 p0061 N68-23895*#
 NASA-TM-X-1761 p0217 N69-20875*#
 NASA-TM-X-1871 p0013 N69-35723*#
 NASA-TM-X-1919 p0226 N70-11975*#
 NASA-TM-X-2130 p0238 N71-11689*#
 NASA-TM-X-2161 p0240 N71-18866*#
 NASA-TM-X-2193 p0240 N71-17933*#
 NASA-TM-X-2234 p0061 N71-20471*#
 NASA-TM-X-2241 p0094 N71-20533*#
 NASA-TM-X-2520 p0063 N72-19057*#
 NASA-TM-X-2567 p0100 N72-25955*#
 NASA-TM-X-2586 p0248 N72-28685*#
 NASA-TM-X-2683 p0258 N73-18981*#
 NASA-TM-X-2742 p0105 N73-18960*#
 NASA-TM-X-52191 p0200 N68-19019*#
 NASA-TM-X-52344 p0116 N68-24657*#
 NASA-TM-X-52438 p0051 N68-31096*#
 NASA-TM-X-52451 p0050 N68-31018*#
 NASA-TM-X-52453 p0205 N68-31042*#
 NASA-TM-X-52472 p0204 N68-29921*#
 NASA-TM-X-52700 p0087 N70-12102*#
 NASA-TM-X-52750 p0229 N70-19190*#
 NASA-TM-X-52774 p0231 N70-25446*#
 NASA-TM-X-52776 p0232 N70-26116*#
 NASA-TM-X-52822 p0233 N70-29864*#
 NASA-TM-X-52995 p0061 N71-21206*#
 NASA-TM-X-59043 p0049 N68-27643*#
 NASA-TM-X-59872 p0049 N68-27564*#
 NASA-TM-X-60795 p0263 N68-14818*#
 NASA-TM-X-60877 p0195 N68-17223*#
 NASA-TM-X-61072 p0048 N68-23182*#
 NASA-TM-X-61123 p0081 N68-25716*#
 NASA-TM-X-61161 p0264 N68-33238*#
 NASA-TM-X-62180 p0102 N72-32742*#
 NASA-TM-X-63559 p0054 N69-27843*#
 NASA-TM-X-63671 p0224 N69-37703*#
 NASA-TM-X-65497 p0061 N71-23700*#
 NASA-TM-X-65912 p0019 N72-26971*#
 NASA-TM-X-67829 p0241 N71-24578*#
 NASA-TM-X-67963 p0017 N72-11844*#
 NASA-TM-X-67975 p0246 N72-12166*#
 NASA-TM-X-68035 p0063 N72-21033*#
 NASA-TM-X-68049 p0247 N72-23675*#
 NASA-TM-X-68054 p0063 N72-25022*#
 NASA-TM-X-68129 p0102 N72-32754*#
 NASA-TM-X-68164 p0020 N73-15693*#
 NASA-TM-X-68222 p0020 N73-22711*#
 NASA-TM-X-68230 p0067 N73-22748*#
 NASA-TM-X-68242 p0021 N73-24777*#
 NASA-TM-X-70468 p0022 N73-31990*#
 NASA-TM-X-71427 p0068 N73-32655*#

 NASA-TN-D-4299 p0200 N68-19146*#
 NASA-TN-D-4415 p0047 N68-18998*#
 NASA-TN-D-4459 p0080 N68-19925*#
 NASA-TN-D-4532 p0048 N68-22258*#
 NASA-TN-D-4697 p0204 N68-29960*#
 NASA-TN-D-4727 p0050 N68-30751*#
 NASA-TN-D-4867 p0207 N68-37259*#
 NASA-TN-D-4889 p0052 N69-10798*#
 NASA-TN-D-4897 p0052 N69-10227*#
 NASA-TN-D-5085 p0217 N69-20852*#
 NASA-TN-D-5109 p0053 N69-21088*#
 NASA-TN-D-5234 p0054 N69-28123*#
 NASA-TN-D-5353 p0055 N69-31895*#
 NASA-TN-D-5414 p0224 N69-35732*#
 NASA-TN-D-5461 p0224 N69-37883*#
 NASA-TN-D-5604 p0227 N70-14220*#
 NASA-TN-D-5814 p0233 N70-28433*#
 NASA-TN-D-5859 p0058 N70-29807*#
 NASA-TN-D-6042 p0117 N70-42326*#
 NASA-TN-D-6044 p0096 N71-31456*#
 NASA-TN-D-6478 p0244 N71-36452*#
 NASA-TN-D-6513 p0244 N71-36450*#
 NASA-TN-D-6525 p0243 N71-35233*#
 NASA-TN-D-6692 p0118 N72-18911*#

NASA-TN-D-6804 p0247 N72-24755*#
 NASA-TN-D-7135 p0104 N73-16771*#

 NASA-TT-F-460 p0194 N68-16286*#
 NASA-TT-F-11659 p0048 N68-22401*#
 NASA-TT-F-11825 p0205 N68-30811*#
 NASA-TT-F-12010 p0214 N69-14070*#
 NASA-TT-F-13585 p0266 N71-23515*#
 NASA-TT-F-13668 p0095 N71-28159*#
 NASA-TT-F-13744 p0243 N71-35787*#
 NASA-TT-F-13783 p0242 N71-32212*#
 NASA-TT-F-13836 p0063 N72-14032*#
 NASA-TT-F-14279 p0100 N72-25345*#
 NASA-TT-F-14498 p0065 N73-10051*#
 NASA-TT-F-14650 p0066 N73-15598*#
 NASA-TT-F-14872 p0106 N73-21253*#
 NASA-TT-F-14873 p0106 N73-21238*#
 NASA-TT-F-14876 p0252 N73-22662*#
 NASA-TT-F-14903 p0107 N73-23011*#
 NASA-TT-F-14933 p0107 N73-24268*#
 NASA-TT-F-14963 p0068 N73-26976*#
 NASA-TT-F-15037 p0110 N73-29004*#
 NASA-TT-F-15050 p0111 N73-29009*#
 NASA-TT-F-15068 p0111 N73-29008*#
 NASA-TT-F-15109 p0268 N73-31676*#
 NASA-TT-F-15131 p0111 N73-30976*#
 NASA-TT-F-15147 p0254 N73-31991*#

 NBS-9781 p0095 N71-22717 #
 NE-68-1 p0225 N69-40931 #
 NIC-TRANS-2653 p0011 N68-38243 #
 NLL-DOWNRE-TRANS-419-/9091.9F/ p0091 N70-21080
 NLL-M-22830- (5828.4F) p0067 N73-20584
 NLL-NSTIC-TRANS-2474- (6180.59) p0097 N71-37701
 NLL-RISLEY-TRANS-1783-/9091.9F p0091 N70-20121
 NLL-RISLEY-TRANS-1865-/9091.9F p0091 N70-20349
 NLL-RISLEY-TRANS-1866-/9091.9F p0091 N70-20596
 NLL-TRANS-1166- (9022.9) p0096 N71-35501
 NLL-WH-TRANS-271-/9091.9F/ p0230 N70-21100
 NLL-WINDSCALE-TRANS-414-/9091. p0232 N70-26388
 NP-TR-1884 p0094 N70-39255 #
 NP-17453 p0204 N68-30330 #
 NP-18173 p0093 N70-37298 #
 NP-19069 p0099 N72-20693 #
 NP-19152 p0019 N73-12707 #
 NRC-COW-0348 p0217 N69-20548 #
 NRL-TRANS-1175 p0225 N69-40792 #
 NRL-RTS-5464 p0091 N70-29779
 NSR-1-1 p0232 N70-26434 #
 NSRDC-27-381 p0255 N73-33009 #
 NSRDC-3934 p0255 N73-33009 #
 NSSA-R40-68-5 p0206 N68-35232 #
 NSSA-R40-69-4 p0233 N70-29518 #
 NSTIC-TRANS-1848 p0079 N68-15630 #
 NSTIC/13106/67 p0079 N68-15630 #
 NYO-3622-10 p0190 N68-10758 #
 OCR-17 p0192 N68-12477 #
 ONR-TR-14 p0234 N70-31999 #
 ONR-28 p0244 N71-38510 #
 ONR-29 p0248 N72-27067 #
 ONRL-C-1-71 p0016 N71-23353 #
 ORNL-C-15-71 p0247 N72-15235 #
 ORNL-BIS-72-18-VOL-1 p0018 N72-25635 #

REPORT/ACCESSION NUMBER INDEX

ORNL-IIC-36	p0096	N71-35815 *	QR-2	p0265	N69-24894**
ORNL-NSP-EP-3	p0017	N72-11848 *	QR-2	p0066	N73-15079**
ORNL-TM-1789	p0078	N68-12420 *	QR-3	p0051	N68-31404**
ORNL-TM-1979	p0078	N68-12553 *	QR-3	p0058	N70-30140 *
ORNL-TM-2173	p0083	N69-17558 *	QR-4	p0191	N68-11382 *
ORNL-TM-2204	p0204	N68-30162 *	QR-6	p0060	N71-16472**
ORNL-TM-2358	p0083	N69-19229 *	QR-8	p0047	N68-16074**
ORNL-TM-2366	p0233	N70-29364 *	QR-9	p0048	N68-22991**
ORNL-TM-2451	p0232	N70-25646 *	QTRP-3	p0191	N68-10967 *
ORNL-TM-2493	p0088	N70-12423 *	QTR-1	p0056	N69-40952**
ORNL-TM-2766	p0230	N70-19953 *	QTR-3	p0048	N68-21879**
ORNL-TM-2822	p0015	N70-37097 *	QTR-3	p0057	N70-25500**
ORNL-TM-3359	p0098	N72-17737 *	QTR-5	p0055	N69-32305**
ORNL-TR-1825	p0081	N68-28954 *	QTR-6	p0055	N69-38442**
ORNL-TR-2485	p0244	N71-37044 *	R-756-NSP	p0018	N72-20948 *
ORNL-4324	p0083	N69-19605 *	R-804-NSP	p0258	N72-23979 *
ORNL-4750	p0100	N72-24703 *	R-3431	p0053	N69-22175**
ORO-668	p0086	N69-31272 *	RAE-TR-68191	p0054	N69-24137 *
ORSER-SSEL-TR-20-73	p0112	N73-33264**	RAE-TR-69007	p0060	N71-11063 *
ORSER-SSEL-TR-23-73	p0112	N73-33269**	RAE-TR-72109	p0067	N73-21959 *
OWER-W-144-ARIZ (2)	p0109	N73-27359 *	RCA-647DR-1220	p0046	N68-12252**
P-455	p0219	N69-25803 *	RE-439J	p0253	N73-22912 *
P-4935	p0021	N73-23962 *	REPT.-1	p0081	N68-24990 *
P-5025	p0113	N73-33921 *	REPT.-4	p0205	N68-30681 *
PAPER-E2	p0109	N73-28266*	REPT.-67-C-210	p0201	N68-21439 *
PAPER-E3	p0110	N73-28267*	REPT.-68-44	p0204	N68-30330 *
PAPER-E13	p0110	N73-28277*	REPT.-68-007	p0201	N68-21856 *
PAPER-G18	p0109	N73-28249*	REPT.-68SD4301	p0051	N68-32561*
PAPER-G30	p0109	N73-28261*	REPT.-652-00101-FR	p0052	N68-36630**
PAPER-L24	p0110	N73-28319*	REPT.-3511	p0264	N68-33238**
PAPER-R3	p0110	N73-28361*	REPT-RT-68/719	p0057	N70-17439 *
PB-173765	p0192	N68-12477 *	REPT-1	p0104	N73-15454 *
PB-174982	p0193	N68-15499 *	REPT-6	p0067	N73-20044**
PB-178271	p0011	N68-31703 *	REPT-69-11	p0013	N69-35574 *
PB-178272	p0011	N68-31690 *	REPT-70/CT/TA/EB/O.671/EOLE/B	p0063	N72-14032**
PB-188206	p0014	N70-21569 *	REPT-72-141-922	p0101	N72-31353**
PB-188714	p0014	N70-25747 *	REPT-72-141-1084	p0102	N73-12356**
PB-188715	p0014	N70-25748 *	REPT-73-141-079	p0019	N73-15339**
PB-188716	p0014	N70-25749 *	REPT-280.71.347	p0248	N72-28731 *
PB-188717	p0015	N70-25750 *	REPT-649-73	p0258	N73-30464**
PB-188718	p0015	N70-25751 *	REPT-908	p0247	N72-20764 *
PB-188719	p0015	N70-25752 *	RF-89-0	p0052	N69-11991 *
PB-189938	p0015	N70-37343 *	RF-93-0	p0048	N68-22010 *
PB-190254	p0015	N70-34670 *	RFP-1048	p0080	N68-19265 *
PB-198066	p0017	N71-31900 *	RISO-W-684	p0082	N68-33991 *
PB-198775	p0017	N71-32624 *	RP-P-412	p0264	N69-11907 *
PB-198776	p0017	N71-32625 *	RR-69-9	p0231	N70-25623**
PB-200143	p0266	N72-11410 *	RR-323	p0217	N69-21275 *
PB-207144	p0097	N72-10830 *	RR-344	p0231	N70-24132 *
PB-208550	p0064	N72-31092 *	RSIC-743	p0195	N68-17223**
PB-210359	p0065	N73-10976 *	RSIC-786	p0081	N68-25716**
PB-211393	p0103	N73-14400 *	RT/CHI/68/28	p0082	N69-11048 *
PB-213031	p0020	N73-20820 *	RT/ING-(71) 20	p0250	N73-12784 *
PB-213034	p0020	N73-20991 *	S-14120	p0100	N72-23806 *
PB-214314/7	p0253	N73-25102 *	SAE AIR 1213	p0176	A72-10387
PB-214329/5	p0108	N73-25411 *	SAE PAPER 700160	p0165	A70-25371
PB-218830/8	p0109	N73-27359 *	SAE PAPER 700228	p0073	A70-25897
PR-2	p0102	N73-10372**	SAE PAPER 710369	p0073	A71-24239
PUBL-18	p0227	N70-13927 *	SAE PAPER 730346	p0187	A73-34694
PUBL-1702	p0217	N69-20548 *	SAN-651-118	p0237	N70-37652 *
PWA-3211	p0200	N68-20884 *	SAN-679-U	p0206	N68-32748 *
PWA-3877	p0233	N70-29729**	SAN-679-3	p0191	N68-10967 *
PWA-4210	p0246	N72-14040 *	SAN-679-5	p0205	N68-31544 *
PWA-4363	p0249	N72-30029**	SAPR-1	p0104	N73-15365**
QPR-1	p0108	N73-26337**	SAPR-12	p0219	N69-25396**
QPR-1	p0109	N73-27277**	SC-ARPIC-1011	p0224	N69-38033 *
QPR-2	p0046	N68-15766**			
QPR-2	p0112	N73-31337**			
QPR-7	p0191	N68-11030**			
QPR-14	p0237	N70-37652 *			

REPORT/ACCESSION NUMBER INDEX

SC-DR-69-490 p0230 N70-19359 #
 SC-RR-69-497-A p0267 N73-21084 #
 SC-RR-69-662 p0091 N7C-21251 #
 SC-TM-68-627 p0013 N69-19492 #
 SLA-73-5319 p0068 N73-33007 #
 SM-74/62 p0210 N69-13315 #
 SM-74/83 p0210 N69-13317 #
 SM-74/92 p0210 N69-13319 #
 SM-74/104 p0210 N69-13324 #
 SM-74/201 p0211 N69-13327 #
 SM-74/204 p0211 N69-13329 #
 SM-74/206 p0211 N69-13331 #
 SM-74/209 p0211 N69-13332 #
 SM-74/210 p0211 N69-13333 #
 SM-74/212 p0210 N69-13325 #
 SM-74/217 p0082 N69-13334 #
 SM-74/218 p0212 N69-13335 #
 SM-74/221 p0212 N69-13336 #
 SM-74/225 p0212 N69-13339 #
 SM-74/229 p0212 N69-13341 #
 SM-74/235 p0212 N69-13345 #
 SM-74/236 p0213 N69-13346 #
 SM-74/238 p0213 N69-13347 #
 SM-74/240 p0213 N69-13348 #
 SM-74/242 p0213 N69-13350 #
 SM-74/248 p0213 N69-13352 #
 SM-107/130 p0214 N69-13430 #
 SM-107/134 p0214 N69-13391*#
 SM-107/135 p0209 N69-13045*#
 SM-107/136 p0209 N69-13288*#
 SM-107/142 p0209 N69-13151*#
 SM-107/143 p0209 N69-13286*#
 SM-107/153 p0209 N69-13240*#
 SM-107/158 p0209 N69-13287*#
 SM-107/160 p0214 N69-13818*#
 SM-112/15 p0084 N69-30790 #
 SM-112/24 p0084 N69-30799 #
 SM-112/25 p0085 N69-30800 #
 SM-112/27 p0085 N69-30801 #
 SM-146/57 p0016 N71-13756 #
 SO-70-470-PR p0254 N73-30979 #
 SORIN-T/601 p0091 N7C-21969 #
 SPR-046 p0247 N72-23053*#
 SR-17 p0062 N71-34042*#
 SRC-70-TR-N3001-VOL-2-APP-A p0094 N71-19770 #
 SU-IPR-230 p0205 N68-31787 #
 SU-IPR-274 p0220 N69-27071 #
 TA/OST-NAS-72-34 p0064 N72-31092 #
 TAC-BIBL-1 p0258 N73-33900*#
 TAC-BIBL-1 (71/2) p0259 N73-33904*#
 TAC-BIBL-1 (72/1) p0258 N73-33901*#
 TAC-BIBL-1 (72/2) p0259 N73-33902*#
 TAC-BIBL-1 (72/3) p0259 N73-33903*#
 TE-4055-83-68 p0047 N68-16074*#
 TE-4055-145-68 p0048 N68-22991*#
 TE-4073-70-68 p0046 N68-15766*#
 TE-4073-146-68 p0052 N69-14920*#
 TE-5045-145-69 p0222 N69-30871*#
 TG-230-T533 p0079 N68-15844 #
 TH-69-E-06 p0222 N69-31249 #
 TH-72-E-31 p0253 N73-23757 #
 TI-03-68-35 p0051 N68-35810*#
 TID-3557-1971-SUPPL p0250 N73-12785 #
 TID-24102 p0010 N68-18384 #
 TID-24190 p0012 N69-17184 #
 TID-24190 p0203 N68-29063 #
 TID-24254 p0237 N70-39141 #
 TID-25414 p0099 N72-20472 #
 TID-25814 p0118 N73-33738 #
 TID-26136 p0101 N72-31768 #
 TN23.U7 p0101 N72-31768 #

TPR-88 p0099 N72-18761 #
 TPR-49 p0099 N72-18760 #
 TR-17 p0241 N71-24680 #
 TRG-1808 p0230 N70-22307 #
 TRG-1996 p0093 N70-37284 #
 TRW-E-7443-3-024 p0050 N68-27974*#
 TRW-C4898-HC01-RO-00 p0053 N69-18748*#
 TRW-09681-6002-R000 p0051 N68-36000*#
 TRW-09681-6C08-R000 p0062 N71-36441*#
 TRW-13837-6001-RO-00 p0266 N72-11982*#
 TT-67-33889 p0010 N68-10725 #
 TT-67-62630 p0078 N68-10240 #
 TT-67-63251 p0079 N68-12884 #
 TT-70-55010/3 p0245 N72-11610 #
 TUBIK-15 p0234 N70-32771 #
 U-204 p0095 N71-22717 #
 UAPL-31 p0207 N68-37342 #
 UC-34 p0245 N72-11610 #
 UCRL-TRANS-10133 p0192 N68-16541 #
 UCRL-17758 p0079 N68-17316*#
 UCRL-50382 p0205 N68-30760 #
 UCRL-50537 p0221 N69-28635 #
 UCRL-51228 p0020 N73-16766 #
 UCRL-70795 p0205 N68-31910 #
 UCRL-70863 p0218 N69-23173 #
 UCRL-71010 p0218 N69-22640 #
 UCRL-71205 p0207 N68-35919 #
 UCRL-71500 p0226 N70-12638 #
 UCRL-71753 p0092 N70-28899 #
 UCRL-72349 p0239 N71-15242 #
 UCRL-72411 p0240 N71-15736 #
 UCRL-72879 p0244 N71-38463 #
 UCRL-73187 p0019 N73-12741 #
 UCRL-74697 p0022 N73-33005 #
 UMTA-TRD-52-70-2 p0097 N72-10830 #
 UPTES-71-1 p0065 N73-10976 #
 US-PATENT-APPL-SN-75431 p0065 N72-31637*#
 US-PATENT-APPL-SN-139012 p0265 N70-38713*#
 US-PATENT-APPL-SN-151598 p0235 N7C-34134*#
 US-PATENT-APPL-SN-212496 p0236 N70-36803*#
 US-PATENT-APPL-SN-245063 p0248 N72-27230*#
 US-PATENT-APPL-SN-292698 p0254 N73-32109*#
 US-PATENT-APPL-SN-336319 p0252 N73-20931*#
 US-PATENT-APPL-SN-349778 p0059 N70-40234*#
 US-PATENT-APPL-SN-456874 p0095 N71-23499*#
 US-PATENT-APPL-SN-502746 p0225 N69-39898*#
 US-PATENT-APPL-SN-531642 p0240 N71-21693*#
 US-PATENT-APPL-SN-545223 p0060 N71-11056*#
 US-PATENT-APPL-SN-545535 p0053 N69-21539*#
 US-PATENT-APPL-SN-560969 p0060 N71-15622*#
 US-PATENT-APPL-SN-563650 p0218 N69-21929*#
 US-PATENT-APPL-SN-568362 p0225 N69-39883*#
 US-PATENT-APPL-SN-640456 p0062 N71-26726*#
 US-PATENT-APPL-SN-681687 p0061 N71-20273*#
 US-PATENT-APPL-SN-761007 p0062 N71-26155*#
 US-PATENT-APPL-SN-771530 p0246 N72-12136*#
 US-PATENT-APPL-SN-793770 p0239 N71-15562*#
 US-PATENT-APPL-SN-797219 p0062 N71-33409*#
 US-PATENT-APPL-SN-844355 p0247 N72-26031*#
 US-PATENT-CLASS-44-77 p0095 N71-23499*#
 US-PATENT-CLASS-60-23 p0065 N72-31637*#
 US-PATENT-CLASS-60-26 p0065 N72-31637*#
 US-PATENT-CLASS-126-270 p0059 N70-40234*#
 US-PATENT-CLASS-136-89 p0060 N71-11056*#
 US-PATENT-CLASS-136-89 p0062 N71-33409*#
 US-PATENT-CLASS-136-89 p0254 N73-32109*#
 US-PATENT-CLASS-136-202 p0246 N72-12136*#
 US-PATENT-CLASS-136-202 p0247 N72-26031*#
 US-PATENT-CLASS-136-206 p0246 N72-12136*#
 US-PATENT-CLASS-136-227 p0246 N72-12136*#
 US-PATENT-CLASS-156-212 p0062 N71-26726*#
 US-PATENT-CLASS-174-72 p0053 N69-21539*#
 US-PATENT-CLASS-200-39 p0265 N70-38713*#

REPORT/ACCESSION NUMBER INDEX

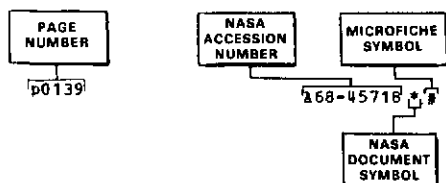
US-PATENT-CLASS-244-1	p0061	N71-20273*
US-PATENT-CLASS-250-212	p0254	N73-32109*
US-PATENT-CLASS-260-2.5	p0062	N71-26155*
US-PATENT-CLASS-310-4	p0225	N69-39898**
US-PATENT-CLASS-310-4	p0235	N70-34134*
US-PATENT-CLASS-310-11	p0218	N69-21929**
US-PATENT-CLASS-310-11	p0225	N69-39983**
US-PATENT-CLASS-310-11	p0236	N70-36803*
US-PATENT-CLASS-315-111	p0239	N71-15562*
US-PATENT-CLASS-315-111	p0240	N71-21693*
US-PATENT-CLASS-321-1.5	p0254	N73-32109*
US-PATENT-CLASS-343-DIG.3	p0246	N72-12136*
US-PATENT-CLASS-343-720	p0246	N72-12136*
US-PATENT-CLASS-343-840	p0246	N72-12136*
US-PATENT-CLASS-350-213	p0060	N71-15622*
US-PATENT-3,141,932	p0265	N70-38713*
US-PATENT-3,158,764	p0236	N70-36803*
US-PATENT-3,202,844	p0235	N70-34134*
US-PATENT-3,229,682	p0059	N70-40234*
US-PATENT-3,333,152	p0240	N71-21693*
US-PATENT-3,393,059	p0095	N71-23499*
US-PATENT-3,422,213	p0053	N69-21539**
US-PATENT-3,422,291	p0218	N69-21929**
US-PATENT-3,446,997	p0225	N69-39898**
US-PATENT-3,453,462	p0225	N69-39983**
US-PATENT-3,473,758	p0061	N71-20273*
US-PATENT-3,481,887	p0062	N71-26155*
US-PATENT-3,493,291	p0060	N71-15622*
US-PATENT-3,493,437	p0060	N71-11056*
US-PATENT-3,535,586	p0239	N71-15562*
US-PATENT-3,565,719	p0062	N71-26726*
US-PATENT-3,591,420	p0062	N71-33409*
US-PATENT-3,594,803	p0246	N72-12136*
US-PATENT-3,666,566	p0247	N72-26031*
US-PATENT-3,678,685	p0065	N72-31637*
US-PATENT-3,760,257	p0254	N73-32109*
USA-NLABS-TR-72-26-CF	p0247	N72-24139 *
USCG-OIL-70-1	p0017	N71-32624 *
USCG-OIL-70-2	p0017	N71-32625 *
USCG-71404-(A)-009	p0098	N72-14478 *
USGS-IR-NASA-218	p0097	N72-12329**
USGS-289-1	p0088	N70-12921 *
USNRDL-R/L-68-10	p0223	N69-32804 *
UTEC-MD-68-006	p0205	N68-30681 *
UTIAS-175	p0099	N72-20479 *
WAED-67-45E	p0206	N68-32748 *
WAED-67-52E	p0205	N68-31544 *
WANL-PR-/DDD/-006	p0238	N70-42733**
WANL-PR-TTT-001	p0059	N70-37465**
WASH-1097	p0090	N70-19219 *
WHOI-REF-72-54	p0103	N73-14400 *
WHO-359	p0112	N73-32300 *
WRL-2122-14-F	p0089	N70-16407**
WSCI PAPER 72-27	p0075	A73-16687 *
W73-07420	p0109	N73-27359 *
X-644-72-130	p0019	N72-26971**
X-644-73-205	p0022	N73-31990**
X-716-69-168	p0054	N69-27843**
X-716-69-365	p0224	N69-37703**
X-760-71-135	p0061	N71-23700**

ACCESSION NUMBER INDEX

ENERGY / A Special Bibliography

APRIL 1974

Typical Accession Number Index Listing:



Listings in this index are arranged alphanumerically by accession number. The page number identifies the abstract page on which the citation appears. The IAA or STAR accession number denotes the number by which the citation is identified on that page. An asterisk (*) indicates that the item is a NASA document. A pound sign (#) indicates that the item is available on microfiche. A plus sign (+) indicates a document that cannot be microfiched but for which one-to-one facsimile is available.

p0119 A68-10231
p0119 A68-11240 #
p0119 A68-11941 #
p0119 A68-12258 #
p0023 A68-12549
p0261 A68-12853
p0119 A68-12962 #
p0119 A68-13240
p0119 A68-14136
p0120 A68-14861 #
p0120 A68-15139
p0023 A68-15419 #
p0120 A68-15423 #
p0120 A68-15642 #
p0023 A68-15882
p0120 A68-16360 #
p0120 A68-16523 #
p0023 A68-16784*
p0023 A68-17380*
p0120 A68-17540*
p0121 A68-17791
p0121 A68-17792
p0121 A68-17793
p0121 A68-17797
p0121 A68-17827
p0121 A68-18285 #
p0023 A68-18449 #
p0122 A68-18456 #
p0122 A68-19482
p0122 A68-19561 #
p0122 A68-19791*
p0122 A68-19849*
p0122 A68-19914
p0122 A68-20175*
p0123 A68-20399
p0123 A68-20403
p0023 A68-20595
p0123 A68-20598
p0123 A68-20734
p0024 A68-20738
p0123 A68-20829 #
p0071 A68-21940 #
p0024 A68-22516*
p0024 A68-22525
p0123 A68-22530
p0123 A68-22531
p0124 A68-22534
p0124 A68-22535
p0124 A68-22536
p0124 A68-22537
p0124 A68-22538
p0125 A68-22539
p0125 A68-22540
p0125 A68-22541
p0261 A68-22542*
p0125 A68-22545*
p0125 A68-22547
p0125 A68-22548
p0126 A68-22549
p0126 A68-22803
p0126 A68-22960 #
p0126 A68-23120 #

p0071 A68-23286*
p0126 A68-23796
p0261 A68-23903 #
p0126 A68-23911 #
p0126 A68-23914 #
p0127 A68-23919 #
p0127 A68-23920 #
p0127 A68-23921 #
p0127 A68-23925 #
p0127 A68-23929 #
p0128 A68-23931 #
p0128 A68-23932 #
p0128 A68-24323*
p0128 A68-24403 #
p0128 A68-24872 #
p0128 A68-25596
p0261 A68-25659
p0128 A68-25934 #
p0129 A68-26140
p0129 A68-27085 #
p0129 A68-27110 #
p0071 A68-27231*
p0129 A68-27639
p0129 A68-27650
p0129 A68-29145
p0130 A68-29186 #
p0130 A68-29187 #
p0130 A68-29309
p0130 A68-29598 #
p0130 A68-29729
p0130 A68-29901 #
p0071 A68-30437
p0130 A68-30712
p0131 A68-30774
p0131 A68-31226 #
p0131 A68-31227 #
p0131 A68-31228 #
p0024 A68-31623
p0131 A68-31864
p0131 A68-32685 #
p0024 A68-33039 #
p0131 A68-33438
p0071 A68-33439
p0001 A68-33457*
p0024 A68-34613 #
p0071 A68-35741
p0132 A68-36891
p0132 A68-37062
p0132 A68-37310 #
p0132 A68-38740
p0025 A68-38889*
p0025 A68-39356
p0132 A68-39715 #
p0132 A68-39717 #
p0133 A68-39722 #
p0133 A68-39723*
p0133 A68-39724 #
p0133 A68-39726 #
p0133 A68-40538
p0025 A68-40644
p0025 A68-41092 #
p0133 A68-41161 #

p0133 A68-41217*
p0134 A68-41271 #
p0134 A68-41272 #
p0071 A68-41768
p0134 A68-41790 #
p0025 A68-41941
p0134 A68-42500
p0134 A68-42507
p0261 A68-42515
p0137 A68-42517
p0025 A68-42518*
p0137 A68-42528
p0025 A68-42560*
p0138 A68-42571*
p0138 A68-42581
p0138 A68-42582
p0138 A68-42954
p0138 A68-43067
p0138 A68-43068
p0139 A68-43071
p0139 A68-43072
p0071 A68-43667
p0261 A68-43812
p0025 A68-43817
p0139 A68-44312
p0072 A68-44446
p0139 A68-44776
p0139 A68-44779
p0072 A68-44975 #
p0072 A68-45023 #
p0139 A68-45718*
p0139 A68-45719*
p0140 A68-11801*
p0026 A68-12296
p0140 A68-12425 #
p0140 A68-14099
p0140 A68-14152
p0140 A68-14153
p0140 A68-14154
p0140 A68-14162
p0262 A68-15330
p0026 A68-15675*
p0141 A68-16158*
p0141 A68-17905
p0141 A68-17909 #
p0142 A68-18255
p0072 A68-19456 #
p0142 A68-20124
p0142 A68-20871
p0115 A68-21039
p0142 A68-21054
p0142 A68-21592 #
p0026 A68-21823*
p0142 A68-22457
p0026 A68-22534
p0142 A68-23095
p0143 A68-23102
p0001 A68-23433
p0143 A68-23441 #
p0143 A68-23450 #
p0143 A68-23454 #
p0143 A68-23457 #
p0143 A68-23458 #
p0144 A68-23460 #
p0144 A68-23463 #
p0003 A68-23464
p0144 A68-23471 #
p0144 A68-23473 #
p0144 A68-23475 #
p0145 A68-23479 #
p0145 A68-23480 #
p0145 A68-23483 #

p0145 A69-23484 #
p0145 A69-23487 #
p0146 A69-23490 #
p0146 A69-23491 #
p0072 A69-23975
p0262 A69-23990
p0146 A69-24469
p0146 A69-25214
p0146 A69-25359
p0146 A69-25397
p0147 A69-25399
p0147 A69-25862
p0147 A69-26364
p0026 A69-27465 #
p0004 A69-27468
p0004 A69-27474
p0147 A69-27479 #
p0147 A69-27482 #
p0148 A69-27484 #
p0148 A69-27485 #
p0148 A69-27488 #
p0148 A69-27489 #
p0148 A69-27503*
p0150 A69-27504 #
p0150 A69-27505 #
p0150 A69-27506 #
p0150 A69-27508 #
p0151 A69-27509 #
p0151 A69-27511 #
p0151 A69-27512 #
p0151 A69-27513 #
p0006 A69-28021
p0151 A69-28314 #
p0151 A69-28887 #
p0152 A69-29172
p0155 A69-29190 #
p0155 A69-29191 #
p0026 A69-29261 #
p0156 A69-29278 #
p0156 A69-29279 #
p0156 A69-29911
p0026 A69-30034
p0027 A69-31287
p0156 A69-31914 #
p0156 A69-32417
p0156 A69-32424
p0027 A69-32797 #
p0027 A69-32798 #
p0027 A69-32799 #
p0072 A69-33265 #
p0027 A69-33795
p0156 A69-34700
p0027 A69-35056 #
p0027 A69-35679 #
p0027 A69-35691*
p0028 A69-35707
p0028 A69-35708
p0028 A69-35709
p0028 A69-36418*
p0072 A69-38458
p0157 A69-39027 #
p0157 A69-39165 #
p0006 A69-39477
p0157 A69-39478 #
p0157 A69-39480 #
p0157 A69-40131

ACCESSION NUMBER INDEX

p0157 A69-41363 #	p0033 A70-40623*	p0036 A71-44390 #	p0040 A73-10132
p0158 A69-42236	p0033 A70-41008	p0176 A72-10387	p0182 A73-10434 #
p0161 A69-42260	p0033 A70-41010*	p0176 A72-11064	p0182 A73-10616 #
p0162 A69-42261	p0033 A70-41852 #	p0177 A72-11207 #	p0182 A73-11826*
p0162 A69-42267	p0170 A70-42071	p0036 A72-11770	p0182 A73-11828
p0028 A69-42271	p0262 A70-42454	p0177 A72-14376*#	p0182 A73-11833
p0028 A69-42273	p0170 A70-42499	p0177 A72-15696 #	p0040 A73-12048
p0162 A69-42294	p0170 A70-43361 #	p0074 A72-15743 #	p0075 A73-12955 #
p0073 A69-43142	p0073 A70-43439 #	p0036 A72-15891 #	p0182 A73-13388*#
p0115 A69-43725 #	p0033 A70-43537 #	p0036 A72-15892*#	p0040 A73-14203
p0029 A70-10750	p0170 A70-43539 #	p0037 A72-15893*#	p0040 A73-14204
p0030 A70-10751	p0170 A70-43541 #	p0177 A72-15940 #	p0040 A73-14207
p0030 A70-10752	p0115 A70-44127*#	p0074 A72-16600	p0040 A73-14209*
p0162 A70-10754	p0170 A70-44900 #	p0177 A72-16745	p0040 A73-14210
p0030 A70-10761	p0170 A70-45956 #	p0037 A72-16909 #	p0040 A73-14212
p0030 A70-10762	p0034 A70-46325 #	p0177 A72-16936*#	p0041 A73-14213
p0030 A70-10763	p0262 A70-46352	p0177 A72-17304*	p0041 A73-14216
p0030 A70-10764	p0171 A70-46399	p0037 A72-17751	p0041 A73-14220
p0031 A70-10767	p0171 A71-11192	p0177 A72-18290	p0041 A73-14222
p0031 A70-11932*#	p0171 A71-11193	p0178 A72-18336	p0041 A73-14226
p0162 A70-12068	p0034 A71-11896 #	p0037 A72-18625 #	p0041 A73-14237
p0031 A70-12080	p0007 A71-12120	p0037 A72-18627 #	p0041 A73-14242
p0163 A70-12513	p0171 A71-12195 #	p0178 A72-21275	p0041 A73-14250
p0073 A70-12516*	p0007 A71-13026	p0178 A72-21414	p0041 A73-14251*
p0163 A70-14716 #	p0262 A71-13041	p0178 A72-22401	p0042 A73-14253
p0163 A70-14754 #	p0171 A71-13704 #	p0074 A72-22406	p0263 A73-14744
p0163 A70-14797*#	p0171 A71-14321	p0178 A72-23684	p0182 A73-15118 #
p0163 A70-14896*#	p0262 A71-14767	p0037 A72-24314 #	p0009 A73-15741 #
p0163 A70-14897 #	p0034 A71-16058	p0037 A72-24315 #	p0042 A73-15801 #
p0031 A70-15329	p0034 A71-16071*	p0037 A72-24316 #	p0042 A73-15802 #
p0163 A70-16470 #	p0034 A71-16099	p0178 A72-24700	p0075 A73-15867 #
p0031 A70-16724	p0034 A71-16100*	p0178 A72-25629 #	p0075 A73-16382
p0163 A70-18107 #	p0034 A71-16102	p0115 A72-26186 #	p0182 A73-16586 #
p0164 A70-19321 #	p0034 A71-16103	p0115 A72-26754	p0075 A73-16687 #
p0031 A70-19623 #	p0035 A71-16104	p0178 A72-27721	p0042 A73-16816
p0031 A70-19625 #	p0171 A71-16785 #	p0179 A72-27722	p0182 A73-16980 #
p0164 A70-20703	p0073 A71-17433 #	p0179 A72-27724	p0075 A73-17192
p0164 A70-21274	p0171 A71-20000	p0037 A72-28002	p0009 A73-17608*#
p0032 A70-21721	p0008 A71-21300 #	p0037 A72-28003	p0009 A73-17631*#
p0032 A70-22050	p0172 A71-22136 #	p0038 A72-28005	p0183 A73-17641 #
p0164 A70-22249	p0008 A71-22779*#	p0038 A72-28008	p0183 A73-17667*#
p0032 A70-23522*#	p0172 A71-23441 #	p0038 A72-28016	p0183 A73-17668
p0164 A70-24156 #	p0172 A71-24218	p0038 A72-28021	p0042 A73-18027
p0164 A70-24469	p0073 A71-24239	p0038 A72-28026	p0042 A73-18028
p0164 A70-24570 #	p0073 A71-24852 #	p0038 A72-28034	p0042 A73-18976
p0165 A70-24855	p0172 A71-25898	p0038 A72-28034	p0183 A73-20107
p0165 A70-25033	p0172 A71-25899	p0075 A72-28879 #	p0183 A73-20396
p0165 A70-25036	p0172 A71-26099 #	p0179 A72-29351 #	p0183 A73-20467*#
p0165 A70-25371	p0035 A71-27432*	p0179 A72-29353 #	p0183 A73-22203
p0032 A70-25434 #	p0008 A71-27542	p0179 A72-29354 #	p0042 A73-22438
p0165 A70-25525	p0035 A71-28665	p0179 A72-29355 #	p0042 A73-22439
p0165 A70-25614*#	p0035 A71-28666	p0179 A72-29356 #	p0043 A73-22440*
p0073 A70-25897	p0035 A71-28668	p0179 A72-29364 #	p0183 A73-22751
p0165 A70-27330 #	p0035 A71-28669	p0179 A72-29365*#	p0184 A73-22752
p0166 A70-27670	p0035 A71-28671	p0075 A72-29451 #	p0184 A73-22766*
p0166 A70-27758	p0074 A71-28754	p0039 A72-30225 #	p0043 A73-22782
p0166 A70-28654	p0036 A71-29702	p0180 A72-31375	p0043 A73-22785*
p0166 A70-29492*#	p0172 A71-29879 #	p0039 A72-32131*#	p0043 A73-22791
p0032 A70-29554	p0173 A71-29880 #	p0180 A72-32994 #	p0043 A73-22792
p0073 A70-29999	p0173 A71-30801*	p0180 A72-33876	p0184 A73-22793*
p0166 A70-30100*	p0036 A71-31671 #	p0180 A72-33887	p0184 A73-22799
p0166 A70-30531*	p0036 A71-31672 #	p0263 A72-33894	p0043 A73-22814
p0166 A70-30534	p0173 A71-32212*#	p0039 A72-34264	p0184 A73-22815*
p0166 A70-30535	p0173 A71-32223	p0180 A72-34583*	p0076 A73-22819
p0167 A70-30536	p0173 A71-32274 #	p0180 A72-34603	p0184 A73-22821
p0032 A70-30997	p0173 A71-32853 #	p0180 A72-34604	p0257 A73-22822*
p0032 A70-31606 #	p0174 A71-33037	p0257 A72-35328*#	p0184 A73-22823*
p0115 A70-31851*#	p0074 A71-33291	p0039 A72-35509 #	p0184 A73-22829*
p0032 A70-32424	p0174 A71-33525*	p0039 A72-35516 #	p0009 A73-22830*
p0032 A70-32425 #	p0174 A71-34227*#	p0039 A72-36075	p0185 A73-23278
p0167 A70-33474	p0174 A71-34720 #	p0180 A72-36139 #	p0185 A73-23279
p0033 A70-34131*#	p0174 A71-35273	p0075 A72-36162 #	p0185 A73-23280
p0033 A70-36238 #	p0257 A71-36202	p0181 A72-36166 #	p0185 A73-23473 #
p0073 A70-36657 #	p0174 A71-36404*#	p0075 A72-36169 #	p0043 A73-23601
p0167 A70-38481	p0174 A71-37122*#	p0181 A72-36192 #	p0076 A73-23682 #
p0167 A70-39225 #	p0174 A71-37690	p0181 A72-36332	p0044 A73-24554
p0167 A70-39325	p0074 A71-38076*	p0181 A72-36558	p0185 A73-24594
p0167 A70-39636 #	p0175 A71-38099	p0039 A72-36681	p0185 A73-25386
p0167 A70-39986*#	p0175 A71-38901	p0039 A72-37642*#	p0076 A73-25459
p0167 A70-39988 #	p0175 A71-38908*	p0039 A72-37675	p0076 A73-25465*
p0168 A70-39991*	p0175 A71-38910*	p0039 A72-37780	p0076 A73-25471*
p0168 A70-40001*	p0175 A71-38925*	p0181 A72-39940	p0185 A73-25976
p0168 A70-40003 #	p0176 A71-38927	p0008 A72-43147 #	p0263 A73-25979 #
p0169 A70-40004 #	p0176 A71-38939	p0181 A72-43148*#	p0185 A73-25982*#
p0169 A70-40005 #	p0074 A71-38948*	p0040 A72-43187 #	p0185 A73-25983*#
p0169 A70-40011*#	p0176 A71-38949	p0040 A72-43194 #	p0186 A73-25984*#
p0169 A70-40012 #	p0176 A71-40020	p0181 A72-43723	p0186 A73-25988 #
p0169 A70-40013 #	p0176 A71-40898*#	p0040 A72-45126 #	p0044 A73-26001*#
p0169 A70-40015*#	p0036 A71-42536 #	p0181 A72-45179*#	p0186 A73-26024 #
p0170 A70-40257 #	p0115 A71-44365	p0009 A72-45216 #	p0186 A73-26026 #

ACCESSION NUMBER INDEX

p0186	A73-26028	#	p0046	N68-12252*	#	p0201	N68-21597*	#	p0011	N68-38380	#
p0186	A73-26034	#	p0078	N68-12420	#	p0201	N68-21856	#	p0012	N68-38392	#
p0186	A73-27321	#	p0116	N68-12434	#	p0048	N68-21879*	#	p0207	N68-38458	#
p0186	A73-28071	#	p0192	N68-12477	#	p0201	N68-21974	#	p0207	N69-10111*	#
p0187	A73-28581	#	p0078	N68-12553	#	p0048	N68-22010	#	p0052	N69-10227*	#
p0044	A73-29590	#	p0192	N68-12691	#	p0201	N68-22013	#	p0208	N69-10335*	#
p0044	A73-29591	#	p0079	N68-12884	#	p0048	N68-22258*	#	p0052	N69-10708*	#
p0044	A73-29592*	#	p0192	N68-13094	#	p0048	N68-22401*	#	p0082	N69-11048	#
p0044	A73-29593*	#	p0046	N68-14185*	#	p0081	N68-22608	#	p0082	N69-11230	#
p0044	A73-29594*	#	p0192	N68-14541	#	p0048	N68-22991*	#	p0264	N69-11907	#
p0044	A73-29595	#	p0192	N68-14585*	#	p0202	N68-23140	#	p0208	N69-11943	#
p0044	A73-29596*	#	p0257	N68-14618	#	p0048	N68-23182*	#	p0208	N69-11944	#
p0045	A73-29597	#	p0193	N68-14630*	#	p0202	N68-23346	#	p0052	N69-11991	#
p0187	A73-29598	#	p0079	N68-14746	#	p0049	N68-23528*	#	p0208	N69-12307*	#
p0076	A73-29734*	#	p0263	N68-14818*	#	p0263	N68-23614	#	p0264	N69-12431	#
p0045	A73-30475	#	p0193	N68-15230	#	p0081	N68-23663	#	p0012	N69-12576*	#
p0187	A73-30950	#	p0193	N68-15499	#	p0081	N68-23895*	#	p0208	N69-12577*	#
p0187	A73-31250	#	p0193	N68-15525	#	p0049	N68-23987*	#	p0208	N69-12578*	#
p0045	A73-32193*	#	p0079	N68-15630	#	p0202	N68-24189	#	p0208	N69-12585*	#
p0187	A73-32194*	#	p0193	N68-15641	#	p0202	N68-24455*	#	p0012	N69-12586*	#
p0045	A73-32718	#	p0194	N68-15712	#	p0116	N68-24657*	#	p0209	N69-13045*	#
p0257	A73-33183	#	p0046	N68-15766*	#	p0081	N68-24990	#	p0209	N69-13069	#
p0076	A73-33185	#	p0079	N68-15844	#	p0202	N68-25016	#	p0209	N69-13151*	#
p0076	A73-33360	#	p0263	N68-15938	#	p0010	N68-25106	#	p0209	N69-13240*	#
p0187	A73-34111	#	p0047	N68-16074*	#	p0081	N68-25283*	#	p0209	N69-13286*	#
p0045	A73-34283	#	p0194	N68-16286*	#	p0081	N68-25716*	#	p0209	N69-13287*	#
p0009	A73-34435*	#	p0194	N68-16287*	#	p0202	N68-26381	#	p0209	N69-13288*	#
p0187	A73-34447	#	p0194	N68-16288*	#	p0202	N68-26537	#	p0264	N69-13298	#
p0187	A73-34694	#	p0194	N68-16289*	#	p0203	N68-26786	#	p0012	N69-13314	#
p0045	A73-35312*	#	p0194	N68-16290*	#	p0049	N68-27564*	#	p0210	N69-13315	#
p0045	A73-35313	#	p0194	N68-16291*	#	p0049	N68-27643*	#	p0210	N69-13317	#
p0187	A73-35379	#	p0195	N68-16292*	#	p0049	N68-27926	#	p0210	N69-13319	#
p0009	A73-35469*	#	p0047	N68-16695*	#	p0050	N68-27974*	#	p0210	N69-13324	#
p0076	A73-36250	#	p0047	N68-16882*	#	p0010	N68-28181	#	p0210	N69-13325	#
p0045	A73-36331	#	p0079	N68-17192	#	p0011	N68-28227*	#	p0211	N69-13327	#
p0188	A73-36681	#	p0195	N68-17223*	#	p0203	N68-28714	#	p0211	N69-13329	#
p0116	A73-37498*	#	p0079	N68-17316*	#	p0203	N68-28735	#	p0211	N69-13331	#
p0045	A73-37969	#	p0079	N68-17606	#	p0203	N68-28738	#	p0211	N69-13332	#
p0188	A73-38310	#	p0080	N68-17607	#	p0050	N68-28740	#	p0211	N69-13333	#
p0188	A73-38311*	#	p0195	N68-17793	#	p0050	N68-28741	#	p0082	N69-13334	#
p0009	A73-38373*	#	p0195	N68-17794	#	p0050	N68-28744	#	p0212	N69-13335	#
p0188	A73-38386	#	p0047	N68-17795	#	p0050	N68-28745	#	p0212	N69-13336	#
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p0188	A73-38403	#	p0263	N68-17798	#	p0081	N68-28954	#	p0212	N69-13345	#
p0046	A73-38404	#	p0196	N68-17799	#	p0203	N68-29063	#	p0213	N69-13346	#
p0046	A73-38408*	#	p0196	N68-17802	#	p0081	N68-29161	#	p0213	N69-13347	#
p0046	A73-38409	#	p0196	N68-17803	#	p0204	N68-29921*	#	p0213	N69-13348	#
p0188	A73-38410	#	p0047	N68-17804	#	p0204	N68-29960*	#	p0213	N69-13350	#
p0189	A73-38411*	#	p0196	N68-17805	#	p0204	N68-29990	#	p0213	N69-13352	#
p0189	A73-38412*	#	p0196	N68-17808	#	p0204	N68-30018	#	p0214	N69-13391*	#
p0116	A73-38413*	#	p0196	N68-17809	#	p0204	N68-30162	#	p0214	N69-13670	#
p0189	A73-38414	#	p0197	N68-17810	#	p0082	N68-30262	#	p0214	N69-13818*	#
p0263	A73-38415	#	p0197	N68-17811	#	p0204	N68-30339	#	p0214	N69-14070*	#
p0189	A73-38418	#	p0197	N68-17812	#	p0205	N68-30681	#	p0264	N69-14302	#
p0189	A73-38419	#	p0197	N68-17813	#	p0050	N68-30751*	#	p0214	N69-14760*	#
p0189	A73-38422	#	p0197	N68-17814	#	p0205	N68-30760	#	p0052	N69-14920*	#
p0076	A73-38427	#	p0198	N68-17815	#	p0205	N68-30811*	#	p0264	N69-15054	#
p0077	A73-38429	#	p0198	N68-17816	#	p0050	N68-31018*	#	p0082	N69-15081	#
p0077	A73-38430	#	p0198	N68-17817	#	p0205	N68-31042*	#	p0082	N69-15237	#
p0116	A73-38436*	#	p0198	N68-17818	#	p0051	N68-31096*	#	p0214	N69-15430	#
p0046	A73-38473*	#	p0198	N68-17819	#	p0051	N68-31404*	#	p0082	N69-15543	#
p0046	A73-39247	#	p0198	N68-17820	#	p0051	N68-31526*	#	p0012	N69-15807	#
p0190	A73-39618	#	p0198	N68-17821	#	p0205	N68-31544	#	p0052	N69-15891	#
p0190	A73-39619	#	p0199	N68-17823	#	p0011	N68-31690	#	p0214	N69-16485*	#
p0077	A73-39895	#	p0199	N68-17824	#	p0011	N68-31703	#	p0053	N69-16975*	#
p0077	A73-39896	#	p0199	N68-17825	#	p0205	N68-31787	#	p0083	N69-17117	#
p0077	A73-40766	#	p0199	N68-17826	#	p0205	N68-31910	#	p0012	N69-17184	#
p0077	A73-41172	#	p0199	N68-17828	#	p0206	N68-31928	#	p0053	N69-17227	#
p0190	A73-41676	#	p0199	N68-17829	#	p0051	N68-32561*	#	p0083	N69-17558	#
p0190	A73-41876	#	p0199	N68-17830	#	p0206	N68-32748	#	p0265	N69-18042*	#
p0190	A73-42906	#	p0200	N68-18025	#	p0051	N68-33207*	#	p0215	N69-18068*	#
p0010	A73-43499*	#	p0010	N68-18384	#	p0264	N68-33238*	#	p0215	N69-18439	#
p0116	A73-45025	#	p0047	N68-18466	#	p0082	N68-33391	#	p0215	N69-18440	#
p0190	N68-10050*	#	p0047	N68-18998*	#	p0011	N68-34388*	#	p0215	N69-18441	#
p0078	N68-10240	#	p0200	N68-19019*	#	p0206	N68-34481	#	p0216	N69-18442	#
p0078	N68-10414	#	p0048	N68-19128*	#	p0206	N68-35232	#	p0216	N69-18444	#
p0010	N68-10725	+	p0200	N68-19146*	#	p0206	N68-35442	#	p0216	N69-18445	#
p0190	N68-10758	#	p0080	N68-19175	#	p0206	N68-35663	#	p0216	N69-18446	#
p0078	N68-10864	#	p0080	N68-19265	#	p0011	N68-35752	#	p0216	N69-18447	#
p0190	N68-10892	#	p0080	N68-19925*	#	p0051	N68-35814*	#	p0216	N69-18448	#
p0191	N68-10967	#	p0200	N68-20884	#	p0207	N68-35919	#	p0216	N69-18450	#
p0191	N68-11030*	#	p0010	N68-21035*	#	p0051	N68-36000*	#	p0053	N69-18748*	#
p0191	N68-11139	+	p0080	N68-21041	#	p0052	N68-36630*	#	p0083	N69-19229	#
p0078	N68-11281	#	p0080	N68-21048	#	p0207	N68-37259*	#	p0013	N69-19492	#
p0191	N68-11382	#	p0200	N68-21051	#	p0207	N68-37342	#	p0083	N69-19605	#
p0191	N68-11503	#	p0200	N68-21052	#	p0052	N68-37401*	#	p0083	N69-20205	#
p0192	N68-11664	#	p0201	N68-21331	#	p0207	N68-37410*	#	p0217	N69-20548	#
p0192	N68-11928	#	p0201	N68-21439	#	p0207	N68-37951	#	p0217	N69-20852*	#
p0192	N68-12191	#	p0201	N68-21480	#	p0011	N68-38243	#	p0217	N69-20875*	#

ACCESSION NUMBER INDEX

p0053	N69-21096*	p0257	N69-37570 *	p0091	N70-20121	p0015	N70-36154 *
p0217	N69-21275 *	p0224	N69-37703**	p0091	N70-20349	p0059	N70-36227 *
p0217	N69-21373 *	p0224	N69-37883**	p0117	N70-20511 *	p0236	N70-36408 *
p0217	N69-21376*	p0087	N69-38022 *	p0091	N70-20596	p0236	N70-36803*
p0083	N69-21442 *	p0224	N69-38033 *	p0057	N70-20627**	p0236	N70-36860**
p0053	N69-21539**	p0055	N69-38442**	p0091	N70-20779	p0236	N70-37070**
p0218	N69-21929**	p0224	N69-38506 *	p0091	N70-21010 *	p0015	N70-37081 *
p0053	N69-22175**	p0055	N69-38646**	p0091	N70-21080	p0015	N70-37097 *
p0218	N69-22640 *	p0224	N69-38756**	p0230	N70-21100	p0093	N70-37284 *
p0218	N69-23173 *	p0055	N69-38783**	p0091	N70-21251 *	p0093	N70-37298 *
p0054	N69-23369**	p0013	N69-39189**	p0230	N70-21253 *	p0015	N70-37343 *
p0218	N69-23954 *	p0225	N69-39863 *	p0014	N70-21569 *	p0059	N70-37465**
p0218	N69-23996 *	p0225	N69-39898**	p0230	N70-21895 *	p0236	N70-37638 *
p0218	N69-23998 *	p0225	N69-39983**	p0091	N70-21969 *	p0237	N70-37652 *
p0054	N69-24137 *	p0225	N69-40031 *	p0230	N70-22218	p0016	N70-37672 *
p0054	N69-24313 *	p0225	N69-40586 *	p0230	N70-22247 *	p0237	N70-37715 *
p0265	N69-24894**	p0225	N69-40792 *	p0230	N70-22307 *	p0059	N70-38210 *
p0218	N69-24985 *	p0056	N69-40952**	p0057	N70-22507 *	p0237	N70-38631 *
p0219	N69-25396**	p0226	N70-10047 *	p0265	N70-22537 *	p0265	N70-38713*
p0083	N69-25510 *	p0257	N70-11537 *	p0231	N70-22862**	p0237	N70-38825 *
p0084	N69-25563 *	p0116	N70-10884 *	p0057	N70-22865**	p0093	N70-38878 *
p0219	N69-25803 *	p0117	N70-10885 *	p0057	N70-22907**	p0093	N70-39139 *
p0084	N69-26099 *	p0226	N70-11301 *	p0057	N70-22921**	p0237	N70-39141 *
p0219	N69-26189 *	p0056	N70-11303 *	p0092	N70-23046 *	p0094	N70-39255 *
p0013	N69-26227 *	p0226	N70-11304 *	p0092	N70-23047 *	p0237	N70-39278**
p0219	N69-26241 *	p0226	N70-11305 *	p0092	N70-23048 *	p0094	N70-39314 *
p0219	N69-26242 *	p0226	N70-11429 *	p0092	N70-23049 *	p0016	N70-39315 *
p0219	N69-26243 *	p0056	N70-11427 *	p0231	N70-23985 *	p0094	N70-39680 *
p0220	N69-26520 *	p0226	N70-11975**	p0231	N70-24132 *	p0237	N70-40031 *
p0220	N69-26532 *	p0087	N70-12102**	p0092	N70-24796 *	p0059	N70-40234**
p0220	N69-26620 *	p0056	N70-12119**	p0057	N70-24832 *	p0094	N70-40779 *
p0220	N69-27071 *	p0087	N70-12263**	p0092	N70-25326	p0237	N70-40974**
p0257	N69-27096 *	p0088	N70-12423 *	p0231	N70-25446**	p0016	N70-41770 *
p0220	N69-27397 *	p0226	N70-12638 *	p0057	N70-25500**	p0016	N70-41771 *
p0221	N69-27494 *	p0056	N70-12695 *	p0231	N70-25577 *	p0237	N70-42202**
p0054	N69-27843**	p0088	N70-12921 *	p0231	N70-25623**	p0258	N70-42226 *
p0054	N69-28123**	p0227	N70-13251 *	p0232	N70-25646 *	p0117	N70-42326**
p0084	N69-28160**	p0227	N70-13293 *	p0014	N70-25747 *	p0238	N70-42733**
p0221	N69-28597 *	p0227	N70-13348 *	p0014	N70-25748 *	p0238	N70-42951 *
p0221	N69-28635 *	p0088	N70-13396 *	p0014	N70-25749 *	p0059	N70-43081**
p0221	N69-28781 *	p0227	N70-13927 *	p0015	N70-25750 *	p0238	N71-10992 *
p0054	N69-29374**	p0088	N70-14088 *	p0015	N70-25751 *	p0060	N71-11056*
p0084	N69-29789 *	p0088	N70-14123 *	p0015	N70-25752 *	p0238	N71-11062 *
p0221	N69-29842 *	p0227	N70-14220**	p0232	N70-26116**	p0060	N71-11063 *
p0221	N69-29843 *	p0088	N70-14317 *	p0232	N70-26208 *	p0238	N71-11689**
p0221	N69-29892 *	p0258	N70-14391 *	p0232	N70-26388 *	p0265	N71-11913 *
p0116	N69-29919 *	p0227	N70-14488 *	p0232	N70-26434 *	p0238	N71-12372 *
p0222	N69-29923 *	p0013	N70-14504 *	p0232	N70-26947 *	p0239	N71-13249 *
p0054	N69-30038 *	p0014	N70-14505 *	p0232	N70-28078 *	p0060	N71-13427**
p0222	N69-30078 *	p0014	N70-14506 *	p0058	N70-28421**	p0266	N71-13514**
p0084	N69-30776 *	p0117	N70-14509 *	p0233	N70-28433**	p0016	N71-13756 *
p0084	N69-30790 *	p0117	N70-14511 *	p0092	N70-28685 *	p0239	N71-15010 *
p0084	N69-30799 *	p0117	N70-14512 *	p0092	N70-28899 *	p0239	N71-15039 *
p0085	N69-30800 *	p0227	N70-14518 *	p0233	N70-29012 *	p0094	N71-15083 *
p0085	N69-30801 *	p0014	N70-14519 *	p0092	N70-29067 *	p0239	N71-15242 *
p0222	N69-30871**	p0228	N70-14933 *	p0233	N70-29169**	p0239	N71-15562*
p0085	N69-31081 *	p0088	N70-15236 *	p0058	N70-29273 *	p0060	N71-15622*
p0085	N69-31119 *	p0089	N70-15280 *	p0233	N70-29364 *	p0239	N71-15723 *
p0085	N69-31161 *	p0089	N70-15491**	p0233	N70-29518 *	p0240	N71-15736 *
p0222	N69-31249 *	p0228	N70-15650 *	p0233	N70-29729**	p0240	N71-16314 *
p0086	N69-31272 *	p0228	N70-16217 *	p0058	N70-29807**	p0060	N71-16462**
p0086	N69-31541 *	p0228	N70-16220 *	p0233	N70-29864**	p0060	N71-16472**
p0086	N69-31655 *	p0228	N70-16221 *	p0058	N70-30140 *	p0060	N71-17248 *
p0055	N69-31895**	p0228	N70-16224 *	p0058	N70-30210 *	p0266	N71-17471**
p0086	N69-31987 *	p0229	N70-16226 *	p0058	N70-30228 *	p0240	N71-17840 *
p0055	N69-32305**	p0229	N70-16227 *	p0058	N70-30229 *	p0240	N71-17933**
p0222	N69-32347 *	p0056	N70-16228 *	p0058	N70-30231 *	p0240	N71-18866**
p0222	N69-32553**	p0056	N70-16229 *	p0059	N70-30232 *	p0118	N71-19463**
p0223	N69-32804 *	p0089	N70-16407**	p0233	N70-30407 *	p0060	N71-19649**
p0223	N69-32934 *	p0089	N70-16584 *	p0059	N70-30560 *	p0094	N71-19770 *
p0086	N69-33693 *	p0089	N70-16585 *	p0234	N70-31239 *	p0061	N71-20273*
p0223	N69-34199 *	p0090	N70-16586 *	p0234	N70-31285 *	p0061	N71-20471**
p0265	N69-34688 *	p0090	N70-16587 *	p0234	N70-31812 *	p0094	N71-20533**
p0265	N69-34689 *	p0090	N70-16588 *	p0234	N70-31999 *	p0061	N71-20727**
p0223	N69-34810**	p0090	N70-16589 *	p0059	N70-32426 *	p0258	N71-20975**
p0223	N69-34812**	p0090	N70-16590 *	p0234	N70-32771 *	p0094	N71-21050 *
p0223	N69-34813**	p0090	N70-16595 *	p0234	N70-32778 *	p0061	N71-21206**
p0086	N69-34967 *	p0057	N70-17439 *	p0235	N70-32986 *	p0095	N71-21304**
p0223	N69-34989**	p0057	N70-17621 *	p0093	N70-33032 *	p0240	N71-21693*
p0223	N69-35224 *	p0090	N70-17649 *	p0235	N70-33216 *	p0266	N71-22199 *
p0087	N69-35240 *	p0229	N70-17651**	p0235	N70-33335 *	p0241	N71-22560**
p0087	N69-35243 *	p0229	N70-18341 *	p0235	N70-33547 *	p0061	N71-22561**
p0224	N69-35289 *	p0117	N70-18542 *	p0235	N70-33672 *	p0095	N71-22717 *
p0013	N69-35574 *	p0229	N70-18728**	p0093	N70-34002 *	p0016	N71-23353 *
p0055	N69-35592 *	p0229	N70-18729**	p0235	N70-34134*	p0095	N71-23499*
p0013	N69-35723**	p0229	N70-19190**	p0015	N70-34670 *	p0266	N71-23515**
p0224	N69-35732**	p0090	N70-19219 *	p0235	N70-34959 *	p0061	N71-23700**
p0224	N69-35785 *	p0230	N70-19359 *	p0093	N70-35477 *	p0061	N71-23714**
p0087	N69-37355 *	p0090	N70-19586 *	p0236	N70-36136 *	p0241	N71-24578**
p0087	N69-37567 *	p0230	N70-19953 *	p0236	N70-36137 *	p0241	N71-24680 *

ACCESSION NUMBER INDEX

p0061	N71-25311*	p0018	N72-16982 *	p0065	N73-12061 *	p0107	N73-23011**
p0062	N71-26155*	p0266	N72-17020**	p0250	N73-12064 *	p0267	N73-23014 *
p0241	N71-26190 *	p0098	N72-17737 *	p0250	N73-12068 *	p0067	N73-23015 *
p0241	N71-26449 *	p0267	N72-17829 *	p0102	N73-12356**	p0107	N73-23414**
p0241	N71-26458 *	p0247	N72-17956 *	p0102	N73-12358**	p0253	N73-23757 *
p0016	N71-26623 *	p0118	N72-18520 *	p0103	N73-12360**	p0253	N73-23765 *
p0062	N71-26726*	p0099	N72-18760 *	p0019	N73-12707 *	p0021	N73-23962 *
p0241	N71-27207 *	p0099	N72-18761 *	p0103	N73-12717 *	p0021	N73-23969 *
p0242	N71-27918 *	p0118	N72-18911**	p0019	N73-12741 *	p0107	N73-24268**
p0095	N71-28159**	p0063	N72-19057**	p0250	N73-12784 *	p0107	N73-24432 *
p0062	N71-28586 *	p0063	N72-19066 *	p0250	N73-12785 *	p0021	N73-24777**
p0242	N71-28680 *	p0099	N72-19686 *	p0250	N73-12800 *	p0253	N73-25102 *
p0242	N71-28718 *	p0018	N72-20371 *	p0250	N73-13056 *	p0068	N73-25104 *
p0016	N71-29471 *	p0099	N72-20472 *	p0250	N73-13061 *	p0253	N73-25106 *
p0095	N71-29603**	p0099	N72-20479 *	p0103	N73-13334**	p0107	N73-25338**
p0017	N71-29607**	p0099	N72-20603 *	p0019	N73-13864*	p0108	N73-25342**
p0095	N71-29852 *	p0099	N72-20603 *	p0250	N73-13865*	p0108	N73-25357**
p0095	N71-29878 *	p0247	N72-20764 *	p0066	N73-13866*	p0108	N73-25366**
p0096	N71-30165 *	p0018	N72-20948 *	p0019	N73-13870*	p0108	N73-25392**
p0242	N71-30458 *	p0063	N72-21033**	p0103	N73-13991**	p0108	N73-25411 *
p0096	N71-30522 *	p0247	N72-21497 *	p0103	N73-13992**	p0253	N73-26055**
p0096	N71-31456**	p0247	N72-23053**	p0267	N73-13997 *	p0267	N73-26054 *
p0017	N71-31900 *	p0099	N72-23284 *	p0103	N73-14315**	p0108	N73-26337**
p0062	N71-31939 *	p0099	N72-23295 *	p0103	N73-14343**	p0068	N73-26818**
p0242	N71-32212**	p0099	N72-23655 *	p0103	N73-14400 *	p0068	N73-26976**
p0017	N71-32624 *	p0247	N72-23675**	p0251	N73-14746 *	p0108	N73-27252**
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p0096	N71-35178 *	p0018	N72-25929 *	p0020	N73-15699 *	p0110	N73-28372**
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